Farmer's Book

A

SERIES OF ESSAYS

ON

AGRICULTURE & RURAL AFFAIRS

IN FORTY-SEVEN NUMBERS.

BY "AGRICOLA."

A North-Carolina Farmer.

"Of all human acquisitions, nothing is better, nothing more excellent, nothing more delightful, and nothing more worthy of a freeman, than Agriculture." CICERO.

"Agriculture is the great art which every government ought to protect, every proprietor of land to practise, and every enquirer into nature to improve." DR. JOHNSON.

"Upon Agriculture, the foundations of individual happiness and national prosperity must rest for support. It embraces all that can render life supportable and desirable—all that can render nations great and prosperous—all that can give employment to commerce and existence to manufactures—all that can augment population and extend civilization." GOV. CLINTON.

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PREFACE.

THE Author, in the Introductory number, has stated so fully his views with respect to the objects of this work, and the resources he employed in composing it, as to render almost superfluous any further remarks on the subject. Being engaged in the pursuits of agriculture, and ardently devoted to them, he is enabled by his experience to stamp much weight on the leading principles of improvement contained in this work, viz. deep and horizontal ploughing, the system of inclosing, manuring, &c. &c. But not trusting to the experience gained on his own farm, his observation has ever been "on the wing" in marking the modes of agriculture and the progress of improvements made on the farms of others; and what his personal observation could not supply, he has endeavored to obtain by a correspondence carried on with the most experienced and distinguished agriculturalists in the different parts of the union.—Nearly all the numerous letters which he addressed to gentlemen residing in the most improved agricultural districts of our country, containing queries on all the leading branches of rural affairs, were promptly answered by them, and in so able and satisfactory a manner, as to enable the author to add much value to this work.—He feels grateful to them for their liberal assistance, and he is sensible that they will receive their merited reward in the consciousness of the utility which their labours will impart to this work. The author's access to a well chosen agricultural library, during a period of several years, has also enabled him to select all the latest and most improved modes of husbandry contained in agricultural publications. In making selections, he has paid due regard to our soils and climate, and has only recommended such practices as seemed best adapted to our local circumstances. A preference has also been given to the publications of our own to those of foreign countries, as being more decidedly congenial to our habits, soils, and climates. Where the meaning of an author was abstruse or difficult, he has clothed it in such lan-

guage as to be adapted to the lowest capacities: but where it was originally plain, he has adopted it without alteration. While the author entirely discarded theory, he was *cautious* not to admit any principles or modes of agriculture into this work, which were not supported by the most ample authority.

It is a lamentable, but just remark, that our modes of agriculture are miserably defective, and require much improvement; and in no way, it is conceived, can its amelioration be so effectually promoted as by presenting to the great body of our farmers a work, which, by its cheapness, is accessible to them all, and which at the same time contains, in a short compass, all necessary information, and that too clothed in the plainest language for carrying into effect the latest and most improved modes of cultivating the earth to advantage.

The majority of our farmers are happily a reading people, and when once they get into the habit of reading agricultural works, they will be led to reflect, to enquire, to compare their own modes of management with those recommended; and from whence will arise in their minds a conviction of the necessity of a change, and that for the better. If there be any farmers so prejudiced as to reject the information contained in agricultural publications, let them be reminded of the important truth, that "a life may be spent in acquiring information from individual experience; but knowledge is soon gained from books in which the experience of many is concentrated:" a truth capable of signal amplification, and which it were earnestly to be desired our farmers in general were more sensible of. In fine, it has been the object of the Author, holding this important "truth" in view, to concentrate the knowledge and experience not only of past, but of present times, as to the most improved modes of cultivating the earth. How far this work may promote the important objects for which it was written, time alone will determine; and whatever may be its fate, the Author cannot be deprived of the consolation of having used his exertions to render it useful to the public.

THE AUTHOR.

AGRICULTURAL ESSAYS.

INTRODUCTORY.

NUMBER I.

I propose communicating to the public, in a succession of short Essays, such information on Agriculture and Rural Affairs as I may be able to obtain either from my own experience, that of others communicated personally to me, or by letter, or from the most approved works written on the subject. I shall avail myself of either, or a combination of the whole of these resources in writing each number, according to the nature or importance of the subject. With regard to Agricultural Books, I promise that they shall be diligently consulted, and that all information scattered over many volumes which may be valuable to farmers, shall be faithfully collected, properly arranged, and presented to them. This information, perhaps, will deserve some attention, when it is considered that it will be drawn from books that are expensive and voluminous, and some of them scarce, and therefore, not easily to be acquired by the great body of the people in any other way. It shall also be clothed in language plain and perspicuous, so as to be adapted to the capacities and attainments of the great body of the people called Farmers, for whose benefit I write; and as I am one of them, and have devoted my interests and efforts in the pursuits of Agriculture, it is not to be supposed, that I shall recommend practices to them which are at

variance with our common interests. The only reward which I desire, for the time and labor which must necessarily be bestowed in acquiring and communicating agricultural information to the public, is that it may have a tendency to awaken our farmers to a better sense of their interest, and to excite in them a spirit of enquiry and research, and a thirst for acquiring better information than they now possess on the subjects of their pursuit.

Should such a tendency be effected, may we not confidently hope that prejudice, the great bar to improvements in agriculture, will be destroyed, and that farmers, when convinced of their present imperfect modes of husbandry, will be disposed to enquire after and adopt better.

Nothing is so well calculated to eradicate these prejudices as well written books on the subject of agriculture. But how few of those books are to be found in the houses or libraries of our farmers; perhaps we may find in their possesion a well-written work on medicine, law and some of the sciences, but not one on the subject of agriculture, the most important and interesting to them of all temporal pursuits, one upon which not only their subsistence, comfort and happiness depends, but also that of their posterity.

It is from an ignorance of agriculture, that farmers in general take so little interest and feel so little emulation for distinction in their pursuits.—By many it is supposed, that agriculture is the only profession which requires little or no skill or previous knowledge, and that a man becomes a farmer as soon as he enters on the possession of a farm. Hence, without doubt, arises the miserable state of agriculture among us, and the many unsuccessful attempts by individuals, who have failed from no other cause than the want of sufficient knowledge and experience.

In North-Carolina, the state of agriculture is at the lowest ebb; I speak not this with reproach, but with the deepest regret. But I am happy to behold a spirit for improvement, and improvements making in some sections of the State, which I hope will not be local, but will in time extend to every part of it.

There is a wide space between the present and a more perfect state of agriculture. Much is to be done to arrive at this desirable state. Our present, is a land-killing system, which must be altered for the better; for if persevered in, it must ultimately issue in want, misery and depopulation. Agriculture, as an art, consists not in the impoverishment, but in the continual improvement of the soil.

To effect these improvements, it behoves men of liberal fortunes and enterprize (whose means and whose intelligence enable them to seek after and adopt improved modes of agriculture, and to recommend them to the attention of their fellow-citizens, by teaching their utility and practicability) to step forward in so laudable an undertaking. No subject can be more worthy of the liberal and patriotic mind; nor one which is connected with greater practical benefits and advantages. For "discoveries made in the cultivation of the earth, are not merely for the time and country in which they are developed, but they may be considered as extending to future ages, and as ultimately tending to benefit the whole human race; as affording subsistence for generations yet to come; as mutiplying life, and not only multiplying life, but likewise providing for its enjoyment."

FIRST PRINCIPLES OF AGRICULTURE.

No. II.

Nothing could be of more importance to agriculture, than to define and establish those principles upon which success in its pursuits, depends. Were such principles established, agriculture might soon be reduced to a regular system, and then it could be pursued with certainty and success, which are of the utmost importance to its prosperity. Without the knowledge of first principles, nothing can be expected from any of the practitioners of agriculture worthy of attention; men acquainted with first principles will never deviate from them, while they find them correct: perhaps they may try some experiment consistent with them, and succeed. This, then is the foundation from which we are to expect a rational system of agriculture, adapted to all the varieties of soil, climate, and seasons, with which it must ever be connected. The completion of such a task, however desirable and important, seems almost to be hopeless when it is considered, that the principles and practice of this art, on which the subsistence and comforts of the human race so materially depend; should still be subject to varieties in opinion and contrarieties in practice. Notwithstanding agriculture remains imperfect, although so many ages have elapsed since man was first doomed to cultivate the earth, and countless volumes have been written on the modes of fulfilling his destiny; yet some benefit may however be derived from the most humble attempt at this task, by clearing the way for others to pursue it with abler hands.

1. Industry and attention to agricultural pursuits, and intelligence therein, are indispensable to insure success.

No success in any science or employment useful to mankind, is experienced without industry; and in that of agriculture, its absence more certainly predicts calamity, than in any other. However skilful farmers may be in theory, or however ingenious in conversation, let them not beguile themselves into an opinion that they may dispense with this first necessity of agriculture, and yet keep their estates. Let it therefore be impressed on the mind of every farmer, that all the instruction in the world in this useful science, will avail nothing, if industry be wanting. Strict application and close attention, are essential requisites for a farmer; without these, no matter how well his plans are arranged, yet if he does not personally attend to their execution, he cannot expect them to succeed well. The business of a farmer has been compared to a hoop, which has no end; it is certain that there is no business which requires more particular attention, especially to minute objects; every thing must be attended to, every thing must be saved, and every business done in season.

The true business of the farmer consists, not in driving the plough or engaging in other menial offices, but in allotting and superintending labour, in recording its results, and contriving how and where to dispose of it to the most advantage. To read and think, and attend the public markets, and regulate accounts, and observe what others in the same occupation in the same neighborhood, or even at some distance, are engaged in, is of the utmost importance to the farmer who wishes to prosper in his agricultural pursuits. He should consider himself, as engaged in a business, requiring peculiar and incessant vigilance; in a concern, in which occurring contingencies often require a change of plan, in which

the exercise of judgment is perpetually demanded, and through the want of a sagacious and presiding mind, the manual labour of many, convertible to extreme advantage, may easily become productive only of mischief; or may have substituted for it negligence, indolence and dishonesty. Hence nothing, perhaps, has more retarded the improvement of agriculture, than the erroneous opinion of the simplicity of this science; a science which is various in its branches, comprehending almost every source, and opening a multitude of unsuspected avenues to profit or loss, that cannot be either known or understood, but through the medium of correct accounts and intelligent and indefatigable attention. Yet, farmers have entirely overlooked this subject, and conceive it unnecessary to devote their time and talents to this supposed simple business; and when they commence farming, fall into the general practice, and let out their ground on shares, or commit their business entirely to an overseer. Intelligence in farming will also consist in a freedom from prejudice, that great bar to improvements in agriculture.

The prejudiced farmer may be termed one of those who is bigotedly attached to his own opinions and practices; he considers all agricultural books as made up of theory, and views all improvements that may be introduced as so many pernicious innovations upon his own superior modes. Hence he pursues the beaten track of his forefathers, be that either good or bad, without ever reflecting whether improvements might not be made more conducive to his own prosperity and to the better management of his land. Whereas the intelligent farmer is always impressed with the opinion, that his modes of agriculture, however good, are still susceptible of improvement; nor does he shut his eyes against any improvements that may be recommended in agricul-

tural treatises: but receives without prejudice, and adopts with alacrity, all improved modes of husbandry, whose advantages have been tested by experience.

2. Without draining wet land, no improvement.

Without it, no other operation can be effectual to the end proposed.—When land is gorged with water it can neither be cleaned or cultivated; no labor is sufficient to do it, except in a very uncommon drought, and in some soils, not even then.

If manure is applied to land in this situation, it will promote the natural grasses more than any kind of grain crop.

But the advantages of draining wet lands are so fully established, that it is needless to enlarge on this subject; suffice it however to say, that experienced and skilful farmers have in all ages discovered the necessity and utility of draining wet lands, by which their health and the value of their farms are much increased.

3. Cleaning. This article requires the farmer's constant attention, and by this alone can be rendered effectual. One of the most important principles in agriculture is cleanly farming.

It not only pleases the eye and excites admiration, but yields more profit. Every field in cultivation should be kept entirely clean. All swamps and marshes should be drained, the growth on them cut down or grubbed and entirely removed. All hollows should be cleaned up in the like manner: also all branches and creeks to the very edge of the banks. When a field is cultivated in this manner, it has an uniform, clean, and beautiful appearance, and when in a crop, presents undoubtedly one of the most beautiful sights in nature. We are voluntarily led to admire the possessor of such a farm, for his nice and superior cultivation. By such cultivation, the eye

is not only feasted and an inherent feeling in every man's breast (a taste for uniformity) gratified, but our most sordid wishes are also gratified in the greater abundance of the crops under such management. Whereas, on the other hand, nothing can more disgust or create unfavorable impressions of a farmer's skill, than to see fields under foul and disorderly management. Here a pond or marsh undrained—there a hollow filled with growing shrubs or trees—the banks of branches and creeks covered with patches of briars and thickets, &c.

The owners of such fields, if not for their own profit's sake, should for their credit's sake as farmers, put their fields in a better state for cultivation. By doing so, they would find many acres gained, and not unfrequently proving the most fertile parts of their fields, which before they had considered as useless.

To these advantages are to be added the greater facility which is given to the cultivation of the ground, being now entire, whereas before it was tilled in patches, or separate parts.

I have dwelt the longer on this article from discovering, to my great regret, throughout the state, fields and farms in a state of wretched foulness.

4. Manures will always fail in producing the desired effect, in proportion as draining and cleaning are neglected.

When manure is applied to wet soils, or those gorged with water, it is soon dissolved or wasted; and when applied to land that is not clean, it is improbable to suppose that it will have the desired effect, as it will promote weeds and the natural grasses more than any kind of grain which may be sown.

It is a principle well established in agriculture, that soils to which manure is to be applied, should be well prepared for its reception. The soil should

be well pulverized, by which means the manure can be more intimately mixed with it, and the more intimately they are blended together, the greater the benefit both to the crop and the soil. It may with truth be asserted, that a field well prepared, will yield a better crop with half the manure that another one would, of the same soil, which is badly prepared. This shows the utility of draining and cleaning, by this means preparing land well, in order that manure when applied to it, may have a full and the desired effect.

FIRST PRINCIPLES OF AGRICULTURE

Continued.

No. III.

A change, or a judicious rotation of crops is necessary, in order to keep the soil in good heart and to enable it to produce its utmost.

No principle in agriculture appears to be better established, than that a change or rotation of crops is necessary. The main principles upon which all practices on this subject proceed, are, that some crops are more exhausting than others: that some, altho' of a very impoverishing nature, yet being consumed on the farm, return to it as much as they deducted from it, and perhaps even more: that some admit of profitable tillage and accurate cleaning during their growth, while by others the land is rendered foul by weeds, is exhausted without return, and when applied in succession, will finally impoverish it. Hence it has been found by experience, that a certain arrangement or rotation of crops of these different kinds

opposite characters is necessary to profitable tillage and to the preservation of the soil. Unless this practice be well understood and attended to, the efforts of the farmer in all others will prove abortive and injurious. More land has been destroyed by an injudicious rotation of crops, than by any other practice in the long catalogue of our miserable modes of agriculture, the total neglect of manures excepted. The exhausting crops of tobacco, corn and wheat, have followed in such rapid succession, without giving any thing in return by ameliorating crops, manure or rest, as to have produced the general impoverishment of the best lands of our country. There is hardly a farm in the state of Virginia or North-Carolina but what exhibits the effects of this exhausting rotation of crops, in its galled and worn-out appearance.

It is an established rule in all good farming, that not more than two exhausting crops be taken from the soil, before some return is made to it, either in manure, an ameliorating crop, as red clover, or in sufficient rest; but not that kind of rest, as it is falsely called, when it is turned out to pasture and severely grazed.

No two chaff bearing crops should follow in succession; but the farmer should fix upon such a rotation as will give the necessary proportion of ameliorating with exhausting crops, in order that the former may restore to the earth as much as the latter extracts from it; by attending to this rule, the soil will always be kept in good heart and even continue to improve, provided judicious tillage accompany the rotation.

In fixing on a rotation, a farmer should ascertain what crops are best suited to his farm, and in what succession such crops ought to follow each other so as to make the greatest possible profit, consistently

not only with keeping his land in good heart, but in an improving condition. "A judicious rotation of crops is the ground-work of general improvement. If a judicious system be adopted and persevered in, it cannot fail. No modes of tillage or management can make up for a defective rotation. The same crops, which under one system would be unprofitable and injurious to the land, under another rotation, with intervening ameliorating crops, might not only be profitable, but might promote its fertility."

Selecting and propagating the best heads and ears of the most approved kinds of grain and seeds, is the surest method of preserving them in perfection. Seeds should be selected in the same manner that breeders are selected. Farmers, to improve their stock, pick out the fairest of the particular breed or variety they want to improve, and prosecute the improvement with these selected individuals. In the garden, and in every field of grain, select such individual plants as excel in vigor and productiveness and ripen earliest, under a moral certainty that such plants are peculiarly adapted to such a soil and climate. Some of the most distinguished farmers of our country have acted upon this principle and with great success.

By observing this principle, seeds and grain are prevented from degenerating, have been made to ripen earlier and to increase their prolific powers.

Liberality is the economy of agriculture.

Liberality in procuring good tools or implements for the hands on a farm is the economy of agriculture. Good tools are as essential to a farmer as to the carpenter or any other mechanic; and all know that complete work cannot be expected from the latter, in any branch or profession of their trade, without the requisite tools. Experience has long taught me that a greater loss results to the farmer from defec-

tive implements, than almost from any other cause whatever; the difference between a good and a bad implement, particularly in ploughs, is so great as to constitute an enormous saving on a large farm by the former; a good plough will save half the labor of a bad one, with the great additional advantages of working with more ease to the team, and of doing the work itself better, thereby rendering the customary repetitions not only unnecessary, but pernicious.

Foresight is another item in the economy of agriculture. It consists in preparing work for all weather, and doing all work in proper weather, and at proper times. But in violation of this rule, nothing is more common than a persistance in ploughing, making hay, cutting wheat, and other works, when a small delay might have escaped a great loss; and the labor employed to destroy, would have been employed to save. Crops of all kinds are frequently planted or sown at improper periods, or unseasonably in relation to the weather, from the want of an arrangement of the work on a farm, calculated for doing every species of it precisely at the periods, and in the seasons, most likely to enhance its profit.

A third item in the economy of agriculture, is not to kill time by doing the same thing twice over. When a thing is done, let it be well done, and it will not require to be done soon again; this will invariably be found to be the best economy with respect to all the work executed on the farm.

In closing this article, I cannot do better than adopt the language of an eminent Agriculturalist.—"Liberality constitutes the economy of agriculture, and perhaps it is the solitary human occupation, to which the adage, 'the more we give, the more we shall receive,' can be justly applied. Liberality to the earth in manuring and culture; is the fountain of its bounty to us. Liberality to slaves and work-

ing animals, is the fountain of their profit. Liberality to domestic brutes is the fountain of their manure. The good work of a strong team, causes a profit beyond the bad work of a weak one, after deducting the additional expense of feeding it; and it saves moreover half the labor of a driver, sunk in following a bad one. Liberality in warm houses produces health, strength and comfort; preserves the lives of a multitude of domestic animals; causes all animals to thrive on less food; and secures from damage all kinds of crops. And liberality in the utensils of husbandry, saves labor to a vast extent, by providing the proper tools for doing both the work well and expeditiously—A pinching miserly system of agriculture, may indeed keep a farmer out of prison, but it will never lodge him in a palace. Great profit depends on great improvements of the soil, and great improvements can never be made by penurious efforts. The discrimination between useful and productive, and useless and barren expenses, constitutes the true agricultural secret, for acquiring happiness and wealth. A good farmer will sow the former with an open hand, and eradicate every seed of the latter."

IMPROVEMENT OF LAND.

No. IV.

Agriculture, as an art, consists, not in impoverishing, but in fertilizing the soil, and making it more productive than in its natural state. Such is the effect of every species of agriculture, which can aspire to the character of an art. Its object being to furnish man with subsistence, comfort and happiness, whatever defeats that object, is a crime of the first magnitude. It should therefore be our first study to improve or fertilize our lands, knowing that fertility is the first and grand object to be attained, as upon this only can a good system of agriculture be founded. Of what avail is the best rotation of crops, the best contrived implements of husbandry, or the most perfect use of those implements, when applied to a barren soil? It is absurd to talk of a good system of agriculture—without discovering, that every such system, to be good for any thing, must be bottomed upon fertility. Before, therefore, we launch into any system, let us first learn how to enrich our lands. The disposition of our soil and climate to reward husbandry bountifully, is exhibited in the great crops which are produced on good land under almost any species of cultivation. This is a consideration of high encouragement, and should induce us, to make it the first object of our efforts to improve our lands, as without effecting this, all other agricultural objects, beneficial to ourselves or our country, must fail.

But, instead of attending to this first and important principle in agriculture, how widely do we depart from it; for one acre annually enriched, at least twenty are impoverished.

What is now the present practice of our farmers?

Their practice is to clear a piece of land every year which is very commonly continued until there is little or no wood left, either for fuel or fences; and very often it happens that in the latter stages of this erroneous conduct, more than half their cleared land is so far exhausted, as not to be worth cultivation; more acres of which, than they annually clear, it is simply within their power to reclaim and render as fertile as it ever was, and that with half the expense; yet, strange to tell, every acre is neglected, while the clearing business is pursued with avidity, until at length the fatal blow is struck, and necessity compels them to part with their murdered estates for a trifle, and seek refuge in a new country.

As many are still engaged in the ruinous practice of destroying their lands, they are requested to pause, and seriously consider the consequences of such a system. A system of agriculture whose tendency is to make land annually less fertile, must finally terminate in its impoverishment:—and consequently, in the want and misery of its cultivators. It is well known how prone children are to follow the example of their parents; if there was no other evidence, the conduct of our farmers is full proof of it, who have from age to age followed the beaten track of their fathers, of cutting down their woods and exhausting their lands. How then can a father reconcile it to his conscience, when he considers that the system of farming which he is pursuing must finally terminate in the consequences just mentioned, and that although he may not live to experience them, yet his posterity may, who by the force of example, will naturally adopt the same system.

How this consideration may weigh on the minds of others I know not, but I must confess that it has great weight with me; and if there was no other, it would induce me to use all my efforts to pursue a

good system of agriculture, in order that my posterity might follow the example, and in consequence of it enjoy an ample subsistence, comfort and independence.

All that is necessary, to induce farmers to change their system of agriculture, from one of exhaustion and impoverishment, to one of renovation and improvement, is to convince them of its practicability and utility. Farmers in general, are rational and intelligent, and when reasons of such weight are presented to their minds as to satisfy them that their present modes of agriculture are imperfect and ruinous, they will readily abandon them, and adopt those which are calculated not only to be more profitable to them and their posterity, but also more beneficial to their country.

It has been found in every district and country where agriculture is conducted upon a rational plan, and is consequently in an improved and flourishing condition, that it is much easier, cheaper, and more profitable to improve exhausted lands, than to cut down and reduce to cultivation uncleared or wood lands.

Exhausted lands that have been renovated, far exceed in uniformly profitable product, any thing known by the cultivators of newly cleared lands.—Such lands may, and do, throw up luxuriant crops, for a short period; but their continuance, in a constant and systematical succession, is not experienced. When they are exhausted by bad management, other lands must be sought for; to be also worn out by similar ill treatment. No farmers of well and long cultivated fields, now wish to sacrifice their wood lands, to the acquisition of a new surface. They know the advantages of renovated old lands.

In all cleared lands that have been exhausted by long cultivation, few stumps or roots are to be found;

hence three acres of such land can be cultivated with more ease and less labor, than one acre of new ground; and it must be acknowledged by all, that the labor and time which are necessary to grub an acre of ground, cut down the trees upon it, maul rails and enclose it—coulter it and prepare it for cultivation; would be more than sufficient to collect and make manure enough to manure double that quantity of land, so as to produce far more abundant crops.

And every acre made by an improved management, to produce as much as two acres, is in effect the addition of a new acre; with the great advantages of enabling us to preserve our wood land for fuel, fences and building—of contracting the space to be cultivated—and of shortening the distance of transportation between the fields and the barn or farm yard. The necessity of clearing fresh land every year will be entirely prevented; consequently from the proposed system of improvement will result a vast saving of labor! a vast saving of land! and a vast saving of profit!

Are not then these considerations sufficiently weighty to induce us to adopt the system of improvement proposed?

But there are other considerations which should also have their weight. "Both religion and patriotism powerfully plead for it; and it is our duty—and would be our interest to re-trace our steps, should it even take us half a century of years to recover the fertility first found on our lands. But the process of improving them is not slow, but rapid:—the returns not distant, but near; and the gains not small, but great." Should there be any, notwithstanding what has been said, still disposed "to pre-

fer the murder of the little life left in their lands, to the process of improvement, let them pause and forbear; not for futurity, nor for God's sake, but for their own sake." "The labor yet necessary to kill the remnant of life left in their lands, will suffice to revive them. Employed to kill, it produces want and misery to themselves. Employed to revive, it gives them plenty and happiness."

IMPROVEMENT OF LAND.

Continued.

No. V.

Before we proceed to detail the best modes of improving land, perhaps it will first be proper to mention those practices which have combined to produce its destruction—in order that farmers may more clearly see the propriety of abandoning them, and of adopting the modes to be proposed for its renovation and improvement.

The first cause, or the foundation of all the practices which have evidently tended to the impoverishment of our lands, has arisen from a misconception in farmers as to the true business of agriculture.

It should never be forgotten, that it is the office of agriculture, as an art, to improve, instead of impoverish land. Was this principle duly impressed on the mind and properly attended to, it would soon change the face of our country, from sterility to fruitfulness, and bestow upon its cultivators plenty and happiness, instead of misery and want. "Arts improve the work of nature. When they injure it, they

are not arts, but barbarous customs. It is the business of agriculture, as an art, not to impoverish, but to fertilize the soil, and make it more useful than in its natural state. From this we discover that farmers have for two centuries past been pursuing agriculture, not as an art, but a barbarous custom; for it is a fact, that lands in their natural state, are far more valuable, than those which have undergone our habit of agriculture, of which emigrations are complete proofs."

Unless farmers are fully impressed with the necessity of attending to the principle, that 'it is the business of agriculture to improve, instead of impoverish land,' it will be needless to point out any modes of improving land, as they would be disregarded and neglected, as they have heretofore been. It is high time for farmers to rescue their profession from that decline and degradation under which it has so long languished; and to consider and pursue it as an art capable of the highest improvement, and not only worthy of their attention, but of the talents and attainments of our wisest men.

The following, among many other practices, have evidently combined to produce the impoverishment of our lands, which should be abandoned by all those (as soon as circumstances will possibly permit) who wish to adopt the more rational system of improvement.

1. Giving overseers a part of the crop. 'This necessary class of men are bribed by farmers, not to improve, but to impoverish their land, by a share of the crop for one year. The farm generally is surrendered to the transient overseer whose salary is increased in proportion as he can impoverish the land. The greatest annual crop, *and not the most judicious culture*, advances his interest, and establishes his character; and the fees of these land doctors

are much higher for killing, than for curing. It is common for an industrious overseer, after a very few years, to quit a farm on account of the barrenness occasioned by his own industry; and frequent changes of overseers, each striving to extract the remnant of fertility left by his predecessor, combines with our agricultural ignorance, to form the completest system of impoverishment, of which any other country can boast.

The improvement of land, by the modes hereafter to be detailed, will be found to be entirely incompatible with the practice of giving overseers a part of the crop; for this custom injures both employers and overseers, by gradually diminishing the income of the former, and of course, that of the latter.—Wages in money should be the substitute for a part of the crop—which would correspond with a gradual system of improvement, by which the condition of both parties would be annually bettered—and skill in improving, not a murderous industry in destroying land, would soon become a recommendation to business, and the rule of compensation.

2. The system of tillage which has generally been pursued under the name of the three-shift system, has also tended greatly to the destruction of our lands. This system is Indian corn, wheat, pasture under it, the great body of the farm receives no manure, and no rest; and the result is, that the phrase "the land is killed and must be turned out," has become common over a great portion of the United States.

It will be granted by every reader, that both Indian corn and wheat are exhausting crops; there can, of course, remain no doubt, but that this system impoverishes land two years in three. The only question then is, whether this loss will be compensated, by grazing the field bare during the third year.

From whence is this recompense to come? The ground being loose and open by recent tillage, and unprotected by a strong sward, is exposed to all the injury the tooth and the hoof can inflict. The stock are turned in—all vegetation is eat off, and the ground is "trod to death," by which its pores are closed to all refreshments from the atmosphere, and its naked surface exposed to the heat of a summer's sun, which is able to pierce and expel from stone itself. The same land is again put in corn, and undergoes the same system of tillage, by which it is soon destroyed. 'This three-shift system has only one merit, honesty. In theory it promises to kill our lands; in practice it fulfils its promise.'

3. The neglect of manures. Nothing has more betrayed a want either of industry or of agricultural skill among farmers, than their great neglect of manures. Instead of pursuing the only rational mode for having a flourishing system of agriculture,—that of giving to the earth as much or more than they take from it;—they have, on the contrary, continued to extract exhausting crops from the earth almost every year, without bestowing upon it hardly one dust of manure in return. Under such a system as this, the richest ground in the world would finally be impoverished and rendered unproductive.

4. Injudicious culture. As much land has been more speedily destroyed by washing, arising from injudicious culture, as perhaps from any other cause whatever. If we cast our eyes over the country, we shall find that all hilly lands that have been any time in cultivation, are sterile, not so much by the crops cultivated thereon, as by the soil itself being removed by washing. This evil has principally arisen from the practice of shallow ploughing. If ever a material reformation takes place in our system of agri-

culture, it will chiefly be founded on deep and horizontal ploughing.

In North-Carolina, it has been found that the effects of shallow ploughing on hilly lands terminate in the destruction of the soil. In the improved districts of Virginia, it is found from experience, that when deep and horizontal ploughing are combined they effectually prevent land from washing, an evil which had heretofore been so much dreaded.

In fine, to effect the improvement of our lands, I would propose, that the system by which they have been reduced to their present state of poverty, be in all points reversed.

They have been reduced principally by shallow ploughing, an ill chosen rotation of crops, and a total neglect of manures. Let them be recruited by deep and horizontal ploughing, a favorable rotation of crops, and all the manure which the most skilful and industrious management will afford.

IMPROVEMET OF LAND,

Continued.

No VI.

The modes of improvement best adapted to our soil, climate and circumstances,* and which therefore particularly deserve our attention, may be summed up and combined in the following simple means, viz. 1st. Manuring. 2nd. Good ploughing. 3. The cultivation of artificial grasses, and 4th. Inclosing.—These means if skilfully and industriously applied, will be found to constitute the most effectual modes of improving those vast bodies of exhausted lands with which our state too unfortunately abounds, and which are the principal object of solicitude. There may be other modes which may be preferable for lands in good heart, but there are none which will be found to promote the improvement of lands deficient in fertility in so cheap, certain and rapid a manner.

An opinion too generally prevails with farmers, especially those who have not made the experiment, that the common resources for manuring are scanty and unequal to the end of fertilizing a poor soil.—This opinion is the offspring of a want of industry or skill to collect, or combine them with the other specified means. By preserving every species of litter, especially corn stalks, and applying it before or about the commencement of fermentation; by penning every species of stock in summer, slightly littering their pens with leaves or straw, and folding them on litter in winter; and by preserving the ma-

* The author's remarks are confined to North-Carolina, yet they may be well applied to several of the adjoining states.

nure arising from both means, from being wasted by premature putrescence or evaporation, a poor farm may be gradually improved, until it will yield internal resourses, adequate to a copious annual manuring of one seventh at least of its arable contents.

By good ploughing, is principally to be understood deep ploughing, which may be considered as the basis of all other improvements, as upon it depend the improvement and preservation of the soil. If manure is to be applied to the soil, deep ploughing is rendered highly necessary to insure and prolong its effects by depositing it deep, thereby securing it from evaporation and from being washed off by rain. Deep ploughing is the only sure remedy against washing in hilly lands, particularly if combined with horizontal ploughing.

All worn-out fields, which have been turned out and grown up in broom sedge, may be highly improved by inclosing them and ploughing them deep, so as completely to turn under the broom straw and letting them lie one year. By that period such fields will have improved sufficiently to produce a respectable crop of corn, provided they have been strictly inclosed and all stock prevented from treading the ground; in this case the ground will be preserved light and loose during the year it is inclosed and the broom sedge will become sufficiently rotted to benefit the corn crop. This fact is warranted by repeated observation and experience. Perhaps it may be unnecessary to remark, that the longer such fields which are ploughed in this way are inclosed, and a crop kept off, the more rapidly they will improve.

The cultivation of artificial grasses is also highly indispensable in this system of improvement. It is a maxim in agriculture, which is as true as any axiom in science, that land which is not under the plough and which is at rest, should be in grass. The ad

vantages of resting land under grass are numerous; its roots hold the soil together and thereby effectually prevent the land from washing, it affords to it shade in the summer and warmth in the winter, and is at the same time drawing supplies of manure from the atmosphere through the vegetable process, to be given to the earth through the agency of the plough.

The cultivation of grasses gives to the plough its greatest efficacy; because the advantages of good ploughing towards improving the soil, depend in a great degree upon turning under a coat of vegetable matter below the surface, and thus protecting it against the effects of heat, moisture and air, until its fertilizing principles are caught and absorbed by the crop, instead of being evaporated into the atmosphere. Manure is vegetable matter, and of course vegetables are manure. By cultivating grasses, we prepare a valuable auxiliary for the plough, from which it derives its chief effect in fertilizing the earth; and thereby provide a copious supply of food or manure for other crops.

Inclosing vastly accelerates the process for improving the soil, by increasing the quantity of vegetable matter or manure to be turned under by the plough. To practise it successfully, however, it must be combined with some resource equivalent to the loss of the scanty pasturage, from which it excludes the emaciated cattle. Artifical grazing and hay meadows, of high or lowland, is a resource, by which, whilst nineteen acres are manuring themselves without human toil, one may be made to produce more grass, than the whole twenty now do; and stocks of every kind may be thus rendered infinitely more valuable, both for furnishing subsistence to man, and for fertilizing the earth.

It remains now only to point out the manner, in which the proposed system of improvement, may be practised to the greatest advantage. Every farm where there is a sufficiency of open land, should be laid off into four divisions (reserving enough for lots for hay and for grazing) and each division to constitute a shift; these shifts should be under one fence, cross fences being entirely excluded, for the purpose of carrying effectually into operation the inclosing system. Each shift in succession should be put in Indian corn, to be followed by wheat, and then to remain at rest inclosed and ungrazed for two years and a half. According to this plan, one half of the farm will be in grain, and the other half inclosed and at rest; the ground reserved for the stock should be laid off into lots and highly manured and put in some cleaning crop, to be followed by small grain, on which grass seed should be sown. To illustrate this plan, let us suppose a farm to consist of five hundred acres of open or arable land, four hundred of these acres will be divided into four shifts of one hundred acres each; the remaining one hundred acres should be divided into ten lots of ten acres each; one of these lots ought to be highly manured annually, and cultivated in pumkins, potatoes, peas, cotton, turnips, or any other cleaning crop, to be followed by wheat and grass seed, if these crops are gotten off in time to sow wheat, or by oats and grass seeds, if they are not. Thus two of these ten lots will produce each year heavy and valuable crops, whilst the other eight are in grass; three of these latter ought annually to be cut for hay, and the other five devoted to grazing: the five grazing lots should be grazed in succession, both to alleviate the impoverishment it produces, and to increase the produce of grass. The area upon which the proposed system is calculated,

is no obstacle to its application to any other. Its proportions may be applied to a farm of any size.

Under this system, the farm will undergo an annual and visible improvement, even if no manure be given to it, owing to the benefits of inclosing and to the rest of two and a half years, which allows time for a large produce of vegetable matter, devoted to the improvement of the soil.

But if manure be made with any degree of skill and attention from the resources which the farm will yield, there will be a sufficient portion to devote to all the weakest parts of each shift as they successively come into cultivation, besides that given to one of the lots.

Those who have been in the habit of cultivating their farms under the three-shift system, and of having two thirds of their arable land in grain, may object to the four-shift and inclosing system, as not affording a sufficient space for the employment of the whole labour on the farm. Although one half of the farm is only in grain at a time, yet under the proposed system of improvement, it will soon produce as much as two-thirds of the same land in its impoverished state, with the great advantage of diminishing the space to be cultivated. And the surplus labour which was formerly employed in killing land, may now be advantageously engaged in a more neat and superior cultivation.

"By diminishing space, not only without diminishing, but actually increasing produce, the crops on the farm will be more manageable by the labor, and receive a better cultivation. And the time saved by this diminution of space, is moreover profitably employed in the spring, in supplying manure and sowing grass seeds: previous to wheat harvest, in making hay; in autumn, in ditching and draining, fencing and stubbing; and at all times in a variety of less important, but improving occupations."

MANURES.

No. VII.

On due attention being paid to the making and increase of manures, and to the mode of preserving and managing them, in a great measure, depends the general fertility of farms, and the luxuriance or goodness of crops that are grown upon them. It is therefore, an object of the greatest interest and importance to the farmer, to collect and lay up materials for making manure, to see that nothing is wasted or thrown away, that can possibly be converted to this valuable purpose. This is the great hinge upon which the whole system of agriculture turns—as manures are, in fact, the soul and life of agriculture.

In all parts of the world where agriculture is conducted upon the improved and rational plan of giving to the earth as much, or more, than is extracted from it by cropping, there is as great an emulation among farmers in procuring or making manure, as in making good crops; and he that pays the greatest attention to manure is called the best farmer, as by it he is always enabled to make the best crops. Let us attend to the practice of the farmers in England (where agriculture is conducted upon as improved a plan as in any part of the world) as related to us by an intelligent American travelling through that country.

"The good land of England is much more productive than that of America, and this superiority is probably derived, not so much from greater original strength of soil, as from more skilful agriculture, depending mainly on two great facts, *faithful tillage* and *faithful manuring*.

"The English farmer does not believe that there is any thing necessarily inherent in the nature of a good soil, which makes it productive, independently of nutritious matter and foreign aliment returned to it by the cultivator, as a compensation for the crops it has yielded. Hence *his first, his principal care* is, to collect and form manure from every possible source.

"Nothing is more common, when one is travelling in England, than to see in the roads adjacent to the fields, heaps of compost, consisting of turf, tops of vegetables, as of turnips and carrots, the stubble from the wheat fields, which is cut up by a second reaping, after the crop has been removed; dead animals, the offals of the barnyards and stables, and, in short, every thing which would otherwise be lost, and which is capable by putrefaction, of being converted into vegetable mould.

"It is, therefore, because this business of manuring is so perfectly understood, and so diligently practised in England, more than from any other cause, that their lands are so much richer than ours. Indeed, is it any thing more than an imitation of the economy of nature?

"New countries, when first cleared of their forests are generally fertile, for the obvious reason, that the annual growth of vegetable substances has been for ages, deposited on the surface, and there left to putrify and form a soil. By imitating this natural process, the most barren spot may be rendered fertile; by counteracting it, that is, by removing every thing in crops, and returning nothing in manure, the most fertile spot may, in a few years, be perfectly impoverished. Moreover, the rich mould thus formed, is cultivated, with the most faithful and skilful til-

lage. An English field, when it is ready to receive wheat, looks like a garden. The important result of this thorough manuring and thorough tillage, is the most abundant crops, and, what is not to be disregarded, the utmost neatness in the appearance of the country."

A distinguished farmer of our own country, has observed, that "the agriculturalist who expects to reap good crops from neglecting his manures, is equally a fanatic with the religionist, who expects heaven from neglecting his morals."

Fertility of soil is the great object to be attained, as without this, labor cannot be rendered effective, or good crops obtained; for of what avail is any rotation of crops, the best contrived implements of husbandry, or the most perfect use of those implements, when applied to a barren soil? Fertility of soil is the capital from which all profits in agriculture must be derived. Manuring only can recover this capital, so much of which is already wasted by bad husbandry.

It is the great object to be impressed, and all its modes should be tried. But how are manures to be obtained? The only secret in the business of obtaining them, is industry and attention; and, when once obtained, that none of them be wasted.

In procuring this needful substance, we are first to imitate nature, in collecting all the vegetable matter we can find, suffering nothing to be lost. The animal, the vegetable and the mineral kingdom must be ransacked for something to aid the growth of plants. The ashes of wood and of peat, the muddy depositions of ponds, creeks, &c. the unrespirable portion of our atmosphere, and some of the particles floating therein; the various earthy productions of marle, chalk, plaster of Paris, clay and lime—the

dung of most animals, and likewise the litter of grain crops, are found by experience, when properly employed, to fertilize the earth and to promote the process of vegetation.

MANURES.

Continued.

No. VIII

In this number I shall endeavor to point out the best methods of managing manures while in the farm-yard, and also the state in which they are best applied to the soil. As a great difference of opinion exists on these heads, it is of importance to farmers, that they should be settled according to the sound principles of science and experience. In treating of this subject, I shall not only avail myself of my own experience, but also of the views and opinions of some of the most intelligent agricultural writers on this subject.

That certain vegetable and animal substances, introduced into the soil accelerate vegetation and increase the produce of crops, is a fact known since the earliest period of agriculture; but the manner in which manures act, the best modes of applying them, their relative value and durability, are still objects of discussion.

It is a common practice amongst farmers, to suffer the farm yard dung to ferment till the fibrous texture of the vegetable matter is entirely broken down; and till the manure becomes perfectly cold, and so

soft as to be easily cut with a spade. Independent of the general theoretical views unfavorable to this practise, founded upon the nature and composition of vegetable substances, there are many facts and arguments which shew that it is prejudicial to the interest of the farmer. During the violent fermentation which is necessary for reducing farm-yard manure to the state in which it is said to be completely rotten, not only a large quantity of fluid, but likewise of gaseous matter is lost; so much so, that the dung is reduced one half or two thirds in weight; and the matters which are thus lost by flying off into the air, are valuable parts of the manure, for if retained by the moisture in the soil, they are capable of becoming an useful nourishment for plants. Besides the dissipation of gaseous matter when fermentation is pushed to the extreme, there is another disadvantage in the loss of heat, which if excited in the soil, is useful in promoting the germination of the seed, and in assisting the plant in the first stage of its growth, when it is most feeble, and liable to disease; and the fermentation of manure in the soil must be particularly favorable to wheat crops, in preserving a genial temperature beneath the surface late in autumn, and during winter.

A slight incipient fermentation is, however, undoubtedly of use in the dunghill; for by means of it, a disposition is brought on in the woody fibre, to decay and dissolve, when it is carried to the land, or ploughed into the soil; and woody fibre is always in great excess in the refuse of the farm.

Too great a degree of fermentation is, however, very prejudicial to the composite manure in the dunghill; it is better that there should be no fermentation at all before the manure is used, than that it should be carried too far. This must be obvious, from what has been already said.

From the above statement, the utility is discovered, of applying manures to the soil as soon as fermentation begins, so that it may exert its full action upon the crop, and lose none of its nutritive powers. And, in fermentation beneath the soil, the fluid matter produced is applied instantly, even whilst it is warm, to the organs of the plant, and consequently is more likely to be efficient, than in manure that has gone through the process and in which all the principles have entered into new combinations. The pernicious effluvia disengaged in the process of putrefaction, from animal and vegetable substances, seem to point out the propriety of burying them in the soil, where they are fitted to become the food of vegetables. The fermentation and putrefaction of organized substances in the free atmosphere, are noxious processes; beneath the surface of the ground they are salutary operations—In this case the food of plants is prepared where it can be used; and that which would offend the senses and injure the health, if exposed, is converted by gradual processes, into forms of beauty and usefulness; the effluvia is rendered a constituent of the aroma of the flower, and what might be poison, becomes nourishment to animals and to man.

In cases when farm yard dung cannot be immediately applied to crops, the destructive fermentation of it should be prevented as much as possible: the surface should be defended from the influence of the atmosphere; a compact marle, or a tenacious clay, offers the best protection against the air; and before the dung is covered over, or, as it were, sealed up, it should be dried as much as possible.

Watering dunghills is sometimes recommended for checking the progress of fermentation; but this practice is inconsistent with just chemical views. It may cool the dung for a short time; but moisture is a

principal agent in all processes of fermentation.—Dry fibrous matter will never ferment. Water is as necessary as air to the process; and to supply it to fermenting dung, is to supply an agent which will hasten its decay.

When dung is to be preserved for any time, the situation in which it is kept is of importance. It should, if possible, be defended from the sun. To preserve it under sheds would be of great use; or to make the site of a dunghill on the north side of a wall.

Having treated of the manner in which manures are to be managed while in the farm-yard, and also of the state in which they are to be applied to the soil, I come now to speak of the time and manner of applying them to the soil.

All the manure which is made on the farm during winter, should be hauled out early in the spring, and applied to the soil for the production of fallow crops, particularly that of Indian corn. Every kind of manure ought to be carefully collected, duly sheltered and ploughed in as speedily as possible after it has been carried to the field; the implements and laborers being ready on the spot. If this is neglected, much loss is sustained by the quick evaporation which takes place. The best practice is, therefore, not to carry out more from the yard at a time, than can be conveniently spread upon, and ploughed into the earth in a short time afterwards. The manure should be deposited in the field in heaps, in straight rows; the size of the heaps, and their distance from each other, will be regulated by the quality of the soil; the dung should then be spread and immediately ploughed in, line by line, because it more readily dissolves in the ground when newly covered, and its whole strength is thus secured to the soil.

MANURES.

Continued.

No IX.

For conducting the business of a farm to full advantage, the farmer is to pursue objects which systematically embrace such a regular course of particulars, as shall best follow and depend on each other; for obtaining the one whole of the design of farming. It is not immediate produce alone that we aim at; for, whilst we wish to obtain repeated full crops, our reason assures us, that it is indispensably necessary to that end, that the soil be preserved in full vigor.

The mind, then, is employed principally, on the objects of preservation and improvement of the productive powers of the earth.

Observations on the state of common farming, fix the opinion, that no unconnected, random pursuits, tend to insure a succession of advantageous husbandry, for any length of time.

Well chosen rotations of crops, together with due culture, are believed to be so favorable to the ground as to need but little manure in comparison of what the common, or ill chosen crops absolutely require. Still the steady and attentive application of manures, is held to be an essential duty in farming, a great link of the chain in every instance. If rich soils require, comparatively, but a moderate quantity, in a rotation where ameliorating crops are prevalent, yet middling and poor soils want all that can be obtained; and under the present courses of crops especially, all soils eagerly demand more manure than can be readily procured. These exausting courses we see continually impoverish the soil. Too many

farmers, therefore, incline to move to fresh lands, where they would act the same murderous part over again. Farmers had, therefore, better learn betimes to improve their lands, or at least to keep them in good heart by a steady attention to the making of manures.

The principal source for the production of the greatest quantity of manure on farms, is the farm-yard.—If cattle were confined to these yards throughout the winter and plentifully littered, they would make far more manure than could even be imagined. But the manner in which cattle are at present managed, they hardly make a load of manure. In the present practice, hay and fodder are stacked in the fields, and the cattle are fed round the stacks and fodder houses: the disadvantages whereof are,

1. A wasteful use of the provender.

2. The dung lying as it is dropt without straw, or other vegetable substances brought to it, the manure is little in quantity: and

3. That little not lying in heaps, is reduced abundantly by exhalation and rain, without leaving any thing to the soil.

In the English and Flemish practice (feebly observed by a few of our husbandmen) cattle are carefully housed, or otherwise confined to a fold-yard, in which are shelters against cold rains during the whole winter, and as far through the spring as food will last: the advantages of which, are,

1. A fair expenditure of the provender, without waste.

2. Less exhaustion of the juices; because of the dung lying together in large heaps.

3. The dung being mixed with the straw, and other vegetable substances brought to the beast as litter, the whole is trod together, and forms a large quantity of very valuable manure.

It may be no exaggeration to affirm, that the difference in the quantities of manures obtained from an equal stock of cattle by those several methods, may be as three to one.

If six acres may be annually manured by the inferior method, then may eighteen by the superior.—Now, on a supposition, that manured land is kept in heart five years, without repeating, in the one case but thirty acres will always remain in good order; in the other, ninety acres; a very important difference. Indeed, it is all the difference between an husbandman's poverty and his riches.

Litter is an essential to cattle, when let into yards, without which yard manure is of small account; and, unless it be in full proportion to the number of cattle in the yard, it is not thought highly of; but is as a half done thing. Good farmers in England deem full littering of cattle, when in yards, of such importance, that, after reaping with sickles and inning their wheat, they cut the stubble and stack it for litter.—Besides straw and stubble for litter, they apply to the same use, fern, and such other vegetable substances as they can procure; and they buy straw from common farmers who are not in the practice of littering. In all countries, common farmers are indifferent to improvements; they look not beyond old habits. A full littering is three loads of 12 or 1300 lbs. of straw to each grown beast. Indian corn stalks may be carried from the field in great quantities in a skeleton frame cart (if not cut up and fed when fresh, when they are more nourishing, owing to the saccharine juice with which they abound.) A farm-yard should be so constructed as to prevent any thing from passing away from it. This is done by making an excavation or hollow in the middle of the yard, so

that every part of the surface should descend towards the centre of it. Connected with the farm-yard and opening into it, should be shelters for the cattle, beeves, sheep, &c. These shelters should be closed to the north, east and west points, and only open to the south, in order to secure the stock from the piercing winds and inclement storms of winter. These shelters should be covered with cornstalks or top fodder; the latter the best.—Having such shelters, cattle will keep in better order with a great deal less food, than they would without them; neglect in providing such shelters, reflects severely on the economy and good management of our farmers, especially when it is considered that nearly the same labor which is now consumed in packing away top fodder in the form of stacks, would, if differently packed up, make good shelters for cattle, and at the same time secure this kind of fodder equally well.

The stock should be confined during the whole of the winter in the farm-yard, and not turned out, as is frequently the case, to wander after the provender or miserable fog of the stalk fields, in which they empty themselves and scatter their dung; by which much manure is lost, great injury in many cases done to grass lands, and the stock, from being exposed to cold and other causes, benefited in a far less degree than is commonly imagined. A hoof should not unnecessarily leave the yard.

The farm-yard should always be well supplied with litter of some kind; such as refuse straw, weeds, cornstalks, rich earth or leaves from the woods, or several of them together, in order to imbibe the soakings of the dung and urine dropped by the stock; and of that thrown out of the stables. All kinds of refuse substances capable of being converted into manure, ought to be thrown into the yard. To effect this purpose, every leisure opportunity should be

taken to collect various vegetable matters, such as coarse grasses, leaves, straw, &c. in as large quantities as possible, and the whole should be carried to the yards, and stacked in convenient situations for the purpose of being made use of as litter. Besides these, there are other earthy matters that equally demand attention—such as peat or boggy earth, mud from ponds and ditches, scrapings of roads, and other substances of the same kind, as can be conveniently obtained. Such materials as are necessary, being by these methods procured, the best mode of proceeding seems to be, that of covering the whole of the farm-yard where the cattle stand and tread, as also the sheep-folds, &c. with layers of these vegetable and earthy matters, eight, ten, or more inches thick, according to the number of cattle and other circumstances; the great object in view being to make as much manure as circumstances will possibly permit.

MANURES.

Continued.

No. X.

'The most abundant sources for artificial manure in the most exhausted district of our country, are the offal of Indian corn, the straw of small grain, and the dung of animals. We find in the two first, proofs of the value of dry vegetables as a manure. If these few means for fertilizing the country, were skilfully used, they would of themselves suffice to change its state from sterility to fruitfulness. But they are so egregiously neglected or mismanaged, that we hardly reap a tythe of their value.

'By the litter of Indian corn, and of small grain, and by penning cattle, managed with only an inferior degree of skill, in union with inclosing, I will venture to affirm, that a farm may in ten years be made to double its produce, and in twenty to quadruple it. There is no other secret in the business than that none of these manures be wasted.'

The farmers of our country have been in the habit of cultivating Indian corn from year to year, without learning to avail themselves of half its valuable properties. There is no other crop which yields so much food to man, beast, and the earth.—Its value to the two former will be acknowledged by all; but as respects its value to the latter, farmers appear to be totally ignorant, if we are to judge from the manner in which this food is treated. There is nothing which, if properly managed, is calculated to yield better food or manure to the earth than the stalks of Indian corn; yet, notwithstanding their great value as materials for making manure, farmers

in general permit them to be entirely wasted. They remain in the field in which they grew, exposed to the vicissitudes of the weather, by which they become light and pithy, the most valuable part being evaporated, and few are turned under the soil to rot, to become manure. Were the stalks of Indian corn annually saved, by being cut down and hauled in to litter the stables and farm-yard, they would make manure sufficient to manure many acres; and each acre thus manured, would make more corn than four acres of the same kind of land unmanured; while the former would continue to produce the same superiority of crops in proportion, for several years. If improving land, or the making of good crops, is the wish and object of the farmer, he should certainly not act so much against his interest or in the way of his efforts as to permit his corn stalks to be wasted.

'The stalks of corn should constitute the chief litter and part of the food, both of the stable and farm-yard, during the winter. The sooner they are used after the corn is gathered, the more saccharum remains to bestow value on them as food, and the more manure they will yield, as evaporation diminishes both; and this proceeds far more rapidly while standing single in the field, subject to the vicissitudes of weather, than when immersed in the steady moisture and cold climate of the farm-yard.'

It has been before stated that the farm-yard, to make a great quantity of manure, should be daily and plentifully littered with some kind of vegetable matter capable of speedily undergoing the putrefactive process. Now there is no kind of vegetable matter better calculated for this purpose than corn stalks.—They should be carried morning and evening in loads, into the farm-pen and stable-yard, where becoming

saturated with the fertilizing qualities imbibed from the dung and urine of the stock, they will be in a proper state to be hauled out early in the spring, and buried in the soil. If a considerable part of the farm-yard manure remains unrotted, when taken into the field, it is not to be regretted, only let the quantity be the greater, and have it immediately ploughed in, for I am clearly of opinion, that the putrefying fermentation can no where be carried on to so much advantage as in the soil. Indian corn should be the first crop put upon the ground after the farm-yard manure has been applied to it; because Indian corn thrives better with unrotted manure, than any other crop, and is precisely the crop, and almost the solitary one, ready to associate with coarse litter, the first growing weather which occurs after it is applied.

'The manure ought also to be devoted to Indian corn, because a crop of great value is thereby gained whilst it is going through the process, supposed in England to be necessary to reduce it to vegetable food. Complete putrefaction is there considered as necessary for this end. Whereas, by planting the Indian corn, as soon as the unrotted manure of the farm yard is carried out and ploughed in, its growth is greatly nourished and finally perfected, by the time the putrefaction is completed. It catches the evaporation produced by the moderate fermentation of the rotting vegetable matter of which the manure is compounded, and exactly that portion of manure which is lost, by the custom of rotting it before it is used, becomes the parent of a great crop. By the fall the cornstalks are sufficiently rotted in the soil to benefit a wheat crop to be immediately sown thereon; and even more of the manure is saved for this latter crop, by being mingled in the earth, and subject to a moderate fermentation, than if it had been retained in hot dunghills through the summer, exposed to a vio-

lent effervescence, and then exclusively devoted to this crop upon a naked fallow.'

A distinguished farmer of Virginia, the author of the Arator, observes in that book, that "the extent of surface now manured upon the same farm, by a more careful employment of the same resources, has so far exceeded his expectations, as to have transferred his preference as means of improving the soil, from inclosing to *manuring*, without however lessening the value of the former in his opinion. A field of two hundred acres, aided by both, produced last year a crop of Indian corn averaging ten barrels an acre, and another of eighty, aided only by inclosing and Plaster of Paris, a crop of five barrels. The first being nearly double, and the second, one third beyond their respective products when last in cultures. Under a diminution of the stocks quoted, the surface manured last year exceeded an hundred acres, and will this year extend to one hundred and thirty. It is contemplated to extend it, until it reaches annually a space sufficient for the whole Indian corn crop of the farm." This distinguished farmer is enabled to manure this great quantity of ground, principally by a careful saving and proper management of his corn-stalks. For he observes, that "the regular increase of crops furnishes additional vegetable matter, consisting principally of corn-stalks the chief basis of this rapid improvement." In winter his farm-pens are littered daily and copiously with these stalks. He does not consider it necessary that they should be trodden to pieces; for, when the stalks are saturated with the moisture of the farm-pen, they have acquired all the fertilizing principles, they can hold in that state. They acquire none from being trodden. Their porous texture enables them speedily to absorb what they can contain. After this is effected, it is only necessary to haul

them into the field, and to bury them in the soil, to bring them into a putrescent state.

As wheat straw constitutes a principal part of the litter with all farmers, it is of importance that the best mode of using it should be determined aright. There are three modes,

1. Carrying it from the farm-yard, after having passed through, or being trodden and enriched by cattle. In this mode, the whole of it should be used, as being the best, and agreeable to the principles herein recommended for the management of all kinds of litter to be converted into manure.

The straw used in this way will constitute a necessary part of the food alloted to the cattle. To derive the full advantage from it as used in this way, it ought to be hauled out early in the spring from the farm-yard, before the substance has been wasted by rain, by the sun, and by the wind, and to be buried in the earth as soon after as possible.

2. Spreading the straw on the surface of the ground. Many respectable farmers are attached to this mode, as protecting the soil from the sun; and by keeping it moist, favoring the vegetation underneath, whether spontaneous or artificial; whilst the straw itself is gradually decomposed into a manure. The objection to this mode, is the loss by evaporation, before this last effect is obtained.

3. Turning the straw at once under the surface of the earth. This would seem to be the best mode of managing manures generally; least of their substance being then wasted. When the grain is trodden out from the straw, it is left in a state easily admitting this operation. But some difficulty may attend it, when the grain is threshed from the straw, by the flail, or by the machines now in use, neither of which break the straw sufficiently to pieces. As the principal part of manure used on every farm is made and

collected from the vegetable world, there is another resource of which none is more excellent, so boundless and as lasting, as that which is bountifully bestowed by nature on almost every farm, in the leaves annually produced by our woods. On every farm there are portions of wood land which it is not intended ever to cut down; from these a plentiful supply of valuable litter and manure in leaves and top soil is at all times ready for our stables, farm-pens, and exhausted fields; nor is there any littering and manuring which would be more beneficial. This supply is so copious, the injury to the soil from whence it is taken so small, and less to the timber, that it seems surprising it has not long since been generally recommended and adopted.

MANURES

Continued.

No XI.

Green brush, another species of vegetable manure, deserves not to be overlooked among the modes recommended for improving poor or exhausted farms.

This kind of manure is happily to be found on every farm however poor, and exhausted fields that have been for some time thrown out of cultivation will invariably produce it in an abundance of pine bushes, which may be advantageously employed in curing its galled spots and gullied declivities.—There may be two modes of using brush beneficially.

1st. Spreading it over the whole surface, for the purpose of protecting the earth from the rays of the sun and enabling it to produce a coat of vegetation; if used in this way, it should remain undisturbed at least three or four years, as in this time a great part of the brush will be rotted and thereby converted into an useful manure.

2nd. Where the land is in high ridges and deep furrows, the brush may be laid in the furrows moderately thick, and then cut and trod to make it lie close, that it may not be removed by the winds. There it remains undisturbed for three years or more; by this time, the ridges as well as the furrows, will be highly improved by the brush, from the scattering powers of air and moisture. These ridges on the fourth year, are reversed to cover the brush, by this time in a putrescent state, and thus prepared to rot under ground. By this latter mode of drilling the brush green and permitting it to lie uncovered for three years, then covered by the plough without disturbing it, and lying four years more until the ridges come in course to be reversed, it is made highly useful as a manure. All wood under two inches diameter may be used as brush in either of the above modes, and all over two inches in filling up gullies or for fuel.

'The dung of animals during the summer season is an item of great moment for enriching lands, if it is saved without subtracting from the more valuable item of the winter's farm-yards. The most beneficial mode of its application, is penning cattle and sheep, graduating the size of these pens by observation, until the designed quantity of manure shall be deposited within two weeks at most, and ploughing it in on the day the pen is removed invariably. The loss from evaporation during summer is so great, that a pen ought never to remain above two weeks.

By a regular course of removing these pens throughout a field, and immediately ploughing in the manure, the farmer will be agreeably surprised to find, that the number of acres improved in this way will infinitely exceed his hopes; for his ground will be equally enriched by far less dung, on account of these precautions against evaporation, and the cattle will, of course, go over a far greater space.

'The land thus manured by the 10th of August, may be sown in turnips. After that period, the pens which had stood from fourteen down to ten days (for the time should be diminished as the cattle fatten), should be removed every seven days, because no draft will be made from the land by a turnip crop, the quantity of the manure is increased, the evaporation is diminished by the length of the nights, and the cattle have improved in plight. Cattle and sheep managed in this way, will manure poor land sufficiently to produce fine crops of Indian corn and wheat, and a good crop of red clover after them, with the aid of plaster."

Every farm exhibits many poor exhausted knowls, where improvement has not progressed far, which are not only a great detriment to the appearance, but a material drawback upon the produce of such farms.

Such spots are best managed by hauling and spreading upon them leaves and top soil from the woods, or wheat straw from the barn or granary and penning the farm cattle upon them every night for a certain period.

The cover of the leaves or straw, with the treading and dung of the cattle will have the most desirable effect on such spots and will soon bring them into equal heart with the best parts of the farm.

All the corn cobs on a farm should be carefully saved, and should be weekly scattered in the farm or

stable-yard to preserve them from the fire, where they absorb a rich moisture to be bestowed upon the earth as they gradually decay; thus constituting a valuable addition to the manure made in the farm-yard.

When hogs are put up to fatten, if the pen is made in a proper manner, they may be made to make a good deal of manure, and there is none more valuable than that made by these animals. The hog-pen should be made without a floor and contiguous to a hog-house or shed where the hogs may be dry whenever they please; the pen consisting of a dirt floor, should be made hollowing in the middle, so that all the dung and other manures may be carried by rains into the centre or hollow of it. All the corn cobs which are daily accumulated in the pen should be collected as often, and thrown into the hole or middle of the pen, in order to become saturated with its riches; all the chips which can be collected at the wood-yards should also be thrown into the pen, and also all other litter which may be conveniently come at. If hogs are managed in this way when fatted for pork, they will make more manure than exceeds the value of their food.

Mud taken from the bed of creeks, from marshes and the earth from the bottom of ditches, have been made use of as manure with success. If these matters are hauled out and spread upon poor land, they are found to improve it very much. If they are carted into heaps and are exposed to the frosts during winter, they become mellow and in many instances are found nearly equal to farm-yard dung. But if they are composted or carried in the fall into the hog pens and farm yard, no manure in the spring can be better for Indian corn, wheat, &c.

By removing old or long standing fences, and ploughing up their sites a great deal of valuable ma-

nure may be obtained. This manure which will principally consist of fertile mould, may be collected in heaps after being ploughed up, and used when necessary. No manure is so valuable as this for gardens, for wheat lots or for tobacco; as it is free from producing grubs or worms, or subjecting plants to fire like dung, it being mild and at the same time extremely fertilizing.

Ashes leached and unleached have been extensively used in Agricultural purposes as a manure, and few have been found to succeed better. Ashes succeed best on dry, gravelly and loamy land; they also answer well on a cold or clayey soil, by rendering them more warm and open.

They are found to benefit nearly all kinds of crops; but most strikingly Indian corn, potatoes, flax and grass.

A gill or one handful of unleached or fresh ashes spread round each hill of corn after it is first hoed, has a considerable effect upon it, making the corn far better, and is calculated as equal to a spoonful of Plaster of Paris applied in the same way. Farmers who have been in the habit of annually using unleached ashes as a manure, assert that upon almost every kind of land, one bushel of ashes will produce an additional bushel of corn.

Ashes answer extremely well when applied to high and dry grass land. Red and white clover are much benefited; the latter as much so as from any other manure. Ashes are generally used to most advantage for grain crops, by being spread over and well littered and ploughed in. Ashes sprinkled on land lately turned up from sward, are decidedly the most productive manure that can be applied. Ten loads of this manure, on poor land, will produce or-

dinarily twenty five bushels of wheat; the land is then left in a state for yielding a crop of hay of between two and one and an half tons per acre, which it will continue to do for a great number of years.

In short, no manure has been found as yet, to continue so long in the ground as ashes. When ashes are unleached, viz. when they have not been reduced by water (or by being drawn,) in richness, they are to be used as a manure more sparingly; and when they have, more copiously.

MANURES.

Continued.

No. XII.

Plaster of Paris is a valuable manure, and perhaps has been attended with better effects in those parts of our country where it has been extensively used, than any other manure. No other manure is so cheap and valuable for speedily improving exhausted lands, when used in combination with red clover, as it gives to the latter an almost boundless fertilizing power. As soon as poor lands can be made to bring red clover, their fertility may soon be effected by the use of this manure. One or two bushels of plaster spread or scattered over an acre of clover growing on the poorest land, will make it so luxuriant as to fall on the ground, or if cut to yield one or two tons of good hay.

It is also beneficially used by rolling it with Indian corn seed, bushel for bushel, as it has a good effect on the crop. When spread over the coarse

litter of an enclosed field or over farm yard manure immediately previous to ploughing them in, it has a good effect; as it makes these manures more efficacious and disposes them more speedily to rot.

Marle affords an excellent manure for sandy, dry, gravelly or light lands of any kind; it likewise produces very beneficial effects on mossey and clayey soils; provided a due proportion be applied, and afterwards perfectly dissolved. In fact, it is a species of manure suited to almost every soil and climate. Farmers should always be in search for it on their farms. To our state it would prove more valuable than the mines of Potosi. It is mostly found in low flat lands near the margin of ponds, lakes, and rivers, and at the bottom of low bogs. It usually will be found near the surface of the earth, or within 12 or 18 inches depth. There are three kinds or species of marle. 1st. Calcareous or shell marle. This is generally of a yellowish white, or yellowish grey colour, but in some places of a brown or red cast.—This species of marle is mostly of a loose texture; it effervesces with acids; when pulverized, it feels dry between the fingers; and, if immersed in water, it readily crumbles to pieces, but does not form a viscid mass. 2. Argillaceous or clayey marle, is of a grey, brown, or reddish brown color; being harder, and more unctuous, than the former species, and adheres to the tongue. It effervesces with aqua fortis, or spirit of salt; in water it dissolves more slowly than the former. 3. Sileceous, stony or sandy marle. This species contains a greater proportion of sand, than of chalk or clay. It is of a brownish grey or lead color; it is, in general, friable and flakey, but sometimes forms very hard lumps. It effervesces with acids, but neither dissolves in water, nor moulders so speedily as either of the two former kinds.

The first and third, viz. the shell and stone, are those which abound most in calcareous earth, and have the most sand in their composition; they are, therefore, best adapted to strong, stiff clayey soils.

The second, viz. the clayey marle, or those in which clay is considerably predominant, are found more advantageous in the light, dry, sandy, gravelly and loamy soils.

A good artificial marle may be prepared by mixing equal quantities of pure clay and lime, in alternate layers, so as to form a heap, which should be exposed to the winter frosts. This compound is well calculated for light lands.

Lime is used as a manure, in its mild as well as caustic state; it should, however, never be made use of without duly attending to the nature and constitution of the soil to which it is to be applied, as on this circumstance its success will, in a great measure, depend. In its caustic state, it acts as a decomposing agent on animal and vegetable matter, and is especially recommended where soils possess some dormant principle of fertility. Mild, or slacked lime, is recommended to improve the texture of soils that are deficient in loose or sandy matter; it will also produce good effects, where, in such soils, sulphuric, or other acids exist, that are prejudicial to vegetation, by the power which it possesses of neutralizing them.

Lime, applied in its hot or caustic state to land, tends to bring any hard vegetable matter that it contains into a state of more rapid decomposition and solution, so as to render it a proper food for plants. To all soils, therefore, that are stored with any quantity of inert vegetable matter, with roots or any kind of coarse litter, caustic lime is applied with every advantage.

All sour, cold, stiff or clayey soils it also benefits in the highest degree; as it renders them more warm, lively and open, and destroys or neutralizes all principles contained in them noxious to vegetation.

In the State of Pennsylvania, lime is extensively used as a manure, and with the utmost success.—No farmer there does without it, if it can possibly be procured.

Lime is generally used there in its hot or caustic state; and so careful are they to preserve it in this state that as soon as the lime-stone is burnt, the lime is heaped and covered; lest by being exposed to the influence of the atmosphere, to successive frosts and thaws, rains and snows, it should become as mild as calcareous lime, and therefore lose all its more active and beneficial properties. In Pennsylvania, the farmers know that poor land will not bear so much lime as rich land. From this they conclude that lime must act as a stimulant, and that the quantity applied to the land ought to bear an exact proportion to the quantity of vegetable matter contained in the soil.

From 30 to 35, and sometimes from 40 to 50 bushels, are applied to an acre; it is frequently ploughed into the soil in the fall when the ground is fallowed up; or it lays in heaps in the field till spring and then ploughed or harrowed in.

Indian corn is the first crop that is put on the soil after it has been limed, as it is a gigantic plant and able to imbibe the supplies of food that will be given, or is able to stand the operations of the lime on the soil. Or oats and clover may be sown as the first crop after the land is limed; the clover, in this case, at a year old, will be luxuriant. One of the most beneficial effects of the lime on the land, consists in

rendering the red clover crops extremely luxuriant, which are sown afterwards.

Spreading lime on a clover lay, and suffering it to remain on the surface, through winter, and then ploughed; and the lime being well incorporated by heavy drags or harrows, is found a very advantageous mode. Laying on the lime, and mixing it thoroughly with the soil by frequent stirrings, without dung, is generally preferred. It has been repeatedly observed, that fresh lime and stable manure, put on together, are by no means so efficacious, as when the latter is applied in the season succeeding the liming: Dry vegetable matter ploughed into the soil with fresh lime does better. When land is over limed, the remedy is to give the land a good dressing of farm-yard manure, or any kind of vegetable matter; such as buckwheat or oats turned under, in order to afford something for the lime to act upon; or to let it lie a year or two till the heat of the lime is partly given out, and then it will have its effect.

INCLOSING

No. XIII.

Land is inclosed for the purpose of rearing vegetables to benefit it by their shade, and by extracting manure from the atmosphere to be given to it when elaborated into a form sufficiently permanent to enrich it.

Why are woodlands richer and more productive than worn or exhausted lands? The trees growing on them continually shade the ground, and give to the land an annual dressing of manure in leaves, rotten limbs and trunks, and plants which are spread abroad by the winds and rot on its surface. This dressing of manure which the surface of the earth is annually receiving, forms so many additional layers of vegetable mould: and its fertility, instead of being diminished by the growth of the trees, is constantly augmented by them, they being the agents by which its fertility is effected; hence woodland, or fresh cleared land, is much more rich and productive than soils whose surface is kept naked, and whose fertility is constantly extracted by the crops cultivated thereon, without being restored again. In inclosing lands to be improved, we imitate the process by which nature improves them. Lands that are inclosed, and from which grazing is entirely excluded, however poor, will throw up a coat of vegetables which shade the ground during summer, in autumn they fall and rot, by which its surface is improved. The next year's vegetation becomes more luxuriant, in consequence of the accession of fertility gained by the last year's coat of manure. Thus exhausted fields are annually enriched by an annual dressing of manure in

weeds, grass or clover &c. which fall and rot on their surface.

Inclosed fields will also throw up a growth of bushes, which may be used advantageously in filling up gullies and in curing galled places. In this way it has been found from experience, that exhausted fields which are inclosed, and from which grazing is excluded, annually and rapidly improve. For the purpose of adopting the inclosing system to the greatest advantage, every farm should be divided into four shifts; one of which is only to be cultivated at a time, while the others remain at rest, inclosed and ungrazed.

The best course of crops to be pursued under the inclosing system, is Indian corn—wheat sown in the fall on the same ground with the corn—the next spring red clover sown among the wheat, and after the latter is removed, the clover to remain uncut and ungrazed for two years. Red clover is cultivated by those who wish speedily to improve their lands under the inclosing system: as it extracts and bestows upon the earth in a less time, a greater quantity of atmospherical manure than any other vegetable; and its peculiar propensity to be improved by a top dressing of the plaster, gives it an additional value.

The inclosing system, to succeed well, must be combined with a great number of agricultural practices, at enmity with those which at present prevail.

It is at enmity with the practice of summer fallowing for wheat.

It is at enmity with the practice of shallow ploughing, and accords with that of deep ploughing.

It accords with the doctrine of turning in a clover lay, or a bed of any other vegetable matter, for a crop speedily sown or planted thereon, without disturbing this new bed of vegetables.

It also accords with the practice of ploughing in vegetables in a hard or dry state, instead of a green or succulent state.

It is also at enmity with the custom of exposing a flat surface to the sun, and accords with the practice of cultivating and preserving land in high ridges and deep furrows.

Among the several modes of improving land hereafter to be treated of, inclosing deserves to be ranked as one of the most valuable. It works so widely, so constantly, and at so small an expense of labor, that properly used, it insures an annual improvement.—We have only to inclose our exhausted fields and exclude grazing, to prepare to fertilize their surfaces by successive drafts of manure to be drawn from its inexhaustible treasury, the atmosphere.—'The earth swims in atmosphere, and inhales its refreshments. Vegetables cover the earth, and are the visible agents to which its surface is indebted for fertility. If the vast ocean of atmosphere is the treasury of vegetable food, vegetable manure is obviously inexhaustible. Vegetables take their stand upon the earth to extract the riches of the atmosphere, larger than the earth itself, and to elaborate them into a proper form for fertilizing its surface.'

The advantages of the inclosing system may be happily illustrated by the following experiment:

'A slip of a willow was planted in a box containing 200 pounds of earth: in a few years the willow grew so rapidly as to exhibit a tree of 200 pounds weight, without having diminished the earth in which it grew. Had this willow been cut up and used as a manure, how vastly would it have enriched the 200 weight of earth it grew on. This fact shews that the 200 pounds weight of willow was entirely gained from the atmosphere; and further shews, that by the use of vegetables, we may collect manure from

the atmosphere with a rapidity, and in an abundance far exceeding that of which we have robbed the earth. This 200 pounds weight of willow, was a prodigious donation of manure, by the atmosphere, to the 200 pounds weight of earth in which it grew. It was so much atmosphere condensed by the vegetable process, into a form capable of being received and held by the earth, and of being reduced to manure by putrefaction.'

But the inclosing system may be objected to by some, who may say, "If we inclose our lands and exclude grazing and cultivate but one-fourth part of our farm at a time, what shall we do with our stock and with that part of our labor which is usually employed in cultivating a greater space of land?" These two questions may be answered in one. The surplus labor arising from the inclosing system, may be employed in preparing pasturage for the stock, by draining and cleaning up all marshes and swamps, also all other low or wet places, and converting them into meadow and grass. And some part of the highland may also be devoted exclusively to grazing, by preparing a well turfed standing pasture.

The great object is to exclude the tooth and the hoof from the inclosed fields, to accelerate their improvement under this system; and, in proportion as the land improves, so will the stock increase; for the increase of stock depends as intimately upon the improvement of land, as the increase of crops. Therefore, as the land improves under the inclosing system, so will the crops increase; and, as the crops increase, so must the stock, there being an increased quantity of food, to be consumed, and of vegetable litter to be made into manure.

The surplus labor which has heretofore been employed in killing land, may be more profitably employed in cultivating less land, and consequently, in

doing more justice to it; and in making more abundant crops, by bestowing upon it more faithful tillage and more faithful manuring. The great misfortune with our farmers is, they cultivate too much land.—The consequence is, wretched husbandry and half crops. One of the great advantages of the inclosing four-shift system, over that of the three shift system, (viz. corn—wheat—pasture) is the profit of making greater crops from less land. The same crop from a fourth may produce profit, and yet, a loss from a third. 'If 120 acres of poor land produce 120 barrels of corn, and the expenses of cultivation amount to a barrel an acre, there is no profit; but if 90 acres of the same land are improved by inclosing, so as to produce 120 barrels, there will be a profit of 30 barrels.

'There are still many other objects for the employment of the surplus labor, which must be combined with the four shift and inclosing system, to accelerate and augment the rewards it will bestow.—Hay in abundance must be made, crops will increase, modes of tillage must be improved, transportation will increase with litter, the making of manure, and plaster, if resorted to, is by no means niggardly in providing employment for labor.'

In treating of inclosing, I am fully aware that I have not done the subject that justice which its importance as a system of improving land demands.—But I hope I have said enough to put the mind of the intelligent reader on the track to pursue the subject further—and if he is disposed so to do, he is referred to Taylor's Arator, in which work the subject is treated at large, and with an ability proportionate to its importance.

TRENCH PLOUGHING.

No. XIV.

As ploughing is one of the most important operations in agriculture, every mode of it should be recommended and tried, which promises an improvement either in a saving of labor, in making more abundant crops, or in the amelioration of the soil.

I shall, therefore, in this and some of the following numbers, mention some of the best modes of ploughing land, and then urge some reasons, showing the necessity and utility of deep ploughing.

In Pennsylvania, where agriculture is in a high state of improvement, there is a mode of ploughing which is highly recommended by those to whom it is known to be practicable and easily performed. It is called Trench Ploughing, and the mode of it is now given as described in the Memoirs of the Philadelphia Agricultural Society.

1. Provide a light plough, from 12 to 15 inches wide in the hind part of the span or sole, calculated to pare off the sod from 2 to 3 inches deep, according to the depth of the roots of weeds.

2. A strong heavy Trench plough, capable of turning a depth from 8 to 10 inches of mould, or earth. This must be one or two inches narrower than the paring plough, or it will cut into the unpared sod.

The first is to be drawn by a pair of horses or oxen. The second by two pair of oxen or strength equivalent.

A trench must be first made, with the trench plough as deep as practicable. The paring plough must then pare the sod off the next intended furrow, and turn it into the trench. The trench plough follows

over a body of earth so as to bury all weeds, which are placed too deep for vegetation, and thus, by rotting, become manure.

The mould board of the trench plough, should have a thin plate of flexible iron screwed on its upper edge, vertically, so as to extend the surface and accommodate itself to the curvature of the mould board. With this auxiliary, the loose earth raised by the mould board will be thrown completely into the trench. It is otherwise liable to run over, and choak the plough. Both ploughs, (the latter the most) require elevasses with notches and curvated regulators, to direct and fix both their depth and lateral course. Trench ploughing should be performed in the autumn, and the field lie through the winter, to attract from the air, whatever is the food of plants; and to receive the benefits of frequent frosts and thaws. The subsequent ploughing need be no deeper than usual in good tillage. A fallow crop only should succeed the trenching the first year; and Indian corn may be best adapted, as it admits and requires frequent stirring and exposure of the soil.

Judge Peters, a distinguished agriculturalist of Pennsylvania, is a great advocate for this mode of ploughing; who thus remarks on it: "It is only to worn or infested fields that I ever recommend this mode of ploughing. The burying the old soil, exhausted of every fertilizing quality, filled with the seeds of pestiferous weeds, and indestructible stocks and roots; with the bulbs and seeds of garlic, St. John's wort and the daisy; and other such otherwise uncommorable hosts of foes to my culture of profitable crops, was my motive for trench ploughing progressively, at least fifty acres of my farm. Many years ago I gave an account of my process, and its

results in this mode of ploughing. It was not theory, but the actual product of repeated and successful practice. I brought my fields into a fertility and cleanness of crop, which amply rewarded me; and surprised those who had known those parts of my farm in their apparently hopeless state of exhaustion. So that I have not a trenched field, which is not now the better for the operation. A pair of oxen, and four horses, were generally all I had, for a large farm. With these I could trench and fall plough, as much as I required. It is certain that all soils are not proper for this operation; though more are so, than is generally supposed. Some have told me that it did harm on such soils as mine, which is generally a light loam; yet, I conceive, such soils are the best, for this process." This is certainly a good mode of ploughing on fields *worn*, as it is peculiarly well calculated to destroy any kind of pestiferous weeds with which they may be infested; for any person who attends to the mode above described, will perceive, that the sod of the old surface is entirely covered, by the accession of the substratum thrown over it. Whereas the edges of the sods, in ploughing ever so deep in any other way, are always exposed to vegetate anew. The seeds, bulbs or roots of pestiferous weeds, by means of the mode recommended, being deposited in a deep trench, with a deep cover of earth over them, which they are unable to penetrate by vegetation,—rot, and become an accession of manure to the soil. Judge Peters further observes, that many of his fields which had been brought into *cleanness* of cultivation, by this mode of ploughing, soon regained their cover of weeds and nuisances, when this operation was neglected, by those who had rented them.

There is another mode of ploughing land in use in Pennsylvania, the advantages of which are highly spoken of. It is as follows.

In the first place, coulter the ground with a coulter plough drawn by two horses, about eight or ten inches deep, the cuts being about one foot apart; then plough the land in an opposite direction, with a common bar-share plough with two horses to about the same depth, and let a man follow in the furrow with a narrow spade plough three inches broad, and drawn by one horse, to break the understratum four or six inches deep. Thus the surface is turned eight or ten inches deep, and the ground effectually loosened from twelve to sixteen inches deep. This practice may be adopted on any soil, however dry, hard, or sward bound, provided it is not too stony or stumpy.

An implement called a miner, is frequently used in Europe, with the same view as the coulter plough described above, viz. opening ground to a great depth: It is made very strong, but with one share only, not having any mould board; it therefore rather loosens than turns up the earth. In deep stiff soils, where the surface mould is good, it may be conveniently employed in the same furrow after a common plough, in order to stir the ground to a greater depth. It is an extremely useful implement where working deep is necessary, without bringing up the inert understratum or sub-soil, as in loosening the ground for carrots, or other tap-rooted plants, and in eradicating the roots of thistles, or other weeds which strike deep in the earth.

DEEP PLOUGHING

No XV.

Perhaps there is no subject in Agriculture on which a greater difference of opinion, or against which greater prejudices exist, than deep ploughing. As this is a subject of the utmost importance, as I do not hesitate to consider it the basis of agriculture, and that when combined with horizontal ploughing, is to prove the salvation of our hilly lands, I beg the particular attention and strict impartiality of the reader, whilst I lay before him some facts and arguments in favor of Deep Ploughing.

In treating of this subject, the nature of our climate and its effects on the soil, will first be considered; then it will be endeavored to shew the greater advantages of deep, over shallow ploughing; and that these advantages consist in the preservation of the soil or its prevention from washing, closer planting, greater abundance of crops, and a saving of labor.

1st. Our climate in winter, with respect to heat and cold, is various; the frosts are generally severe, and the ground is usually frozen for one or two months; and a considerable quantity of moisture falls in the different forms of snow, hail and rain.—In summer, thundergusts, with intervals of hot dry weather, are also common. Let us now consider some of the most visible effects of the climate on the lands in tillage.

The winter frosts are no doubt useful, in dividing and ameliorating the soil; repairing, in some degree, the injury it sustained the preceding summer. During summer, a great proportion of the rains falling hastily, the consequence is, that wherever the ground

is not opened to a sufficient depth to imbibe the whole before the surface becomes saturated, or has time to penetrate the hard stratum beneath, a part of the soil becomes fluid, and if the surface is not a dead level, a portion of it is carried off. In Great-Britain, one of the first agricultural countries of Europe, they are not subject either to the excessive heavy rains, or hot dry weather, that we are; absolutely requiring with us, a greater depth of cultivation to counteract the bad effects of the climate on the soil; and yet their ploughing is vastly deeper than ours. The fact is, in our dry and hot climate, deep ploughing is rendered indispensable, not only to prevent the land from washing, but for the preservation of the moisture, and the inhalation of the atmosphere, so necessary to guard our crops against the effects of droughts, common in our climate.

2. It prevents washing. Deep and horizontal ploughing when combined, are found effectually to prevent washing in hilly lands. This is testified by the practice of many intelligent farmers in the state of Virginia,* where this kind of ploughing is coming into general use. But horizontal ploughing, however skilfully done, unless accompanied with deep ploughing, will avail nothing on hilly lands.

Let us now consider some of the effects of shallow ploughing. When lands are cleared, washing is prevented for the first year, by the undecayed fibrous roots remaining in the soil; it generally begins the second, and continues annually. The ploughing being only about four inches deep, does not afford a sufficient quantity of loose earth to imbibe the whole of the heavy showers that frequently fall during summer; the consequence of which is, as before ob.

* This will be shewn in a future number.

served, that when the open soil becomes saturated water must accumulate on the surface, and flowing off in torrents, bears away a portion of the finest and most valuable part of the soil; succeeding ploughings bring to the surface a fresh supply of mould, which in turn, follows the last. Thus, ploughing and washing alternately, following each other, the effects are, that the soil employed in cultivation must annually become less fertile, because the coarse, the heavy, and adhesive particles of earth, remain on the land from the beginning, while the finer and more friendly parts are continually carried away, and thus the land becomes sterile, not so much from the vegetable nutriment being extracted from the soil by the growth of plants, as by the soil itself being removed by washing. That this is a necessary consequence of shallow ploughing on lands that are in any degree hilly, in this climate, I trust is evident to every unprejudiced mind. What further proofs need we, to convince us of the effects of shallow ploughing, than the deserted old fields, washed into gullies, that frequently present their sterile surfaces from Susquehanna to Georgia. Some years ago, I was of opinion that this speedy reduction of soil was altogether occasioned by the nature of the crops cultivated thereon; but on attending more accurately to the subject, I am now convinced that it is more from the manner of cultivation, than the exhausting properties of the crops. As a proof, it has been observed, that when an industrious person from another state or country, where the cultivation is deeper, has settled on these exhausted lands, that they improve, although the same crops, or those equally exhausting, are cultivated, and that in some instances they are made very productive without manure.

8. It admits of closer planting. What is the language of our farmers and planters with respect to

ploughing? "Our soil is not more than two or three inches deep, we must plough shallow, otherwise we shall turn up too great a portion of dead earth, and ruin our crops." They say also we must plant wide, otherwise a drought will cause our corn to fire; and for these supposed weighty reasons, those two practices are almost universally adopted, to wit, shallow ploughing and wide planting. Here our men of experience prove, they are acquainted with the effect, without knowing, or even enquiring into the cause. Their mistaken opinion respecting dead earth, will be noticed in due place; but it remains here to be proved, that the necessity of wide planting is one of the consequences attached to shallow ploughing. All plants imbibe moisture from the earth, by their roots; if this portion of their sustenance is withheld, though every other species of vegetable nutriment abounds in the soil, the plant becomes sickly, growth ceases, and finally death ensues. In search of the necessary supply, the roots of plants are extended in all directions, where the soil is open enough to admit them, and to a distance proportionate to the demand; two plants of the same kind, require a greater quantity to preserve health, than one: hence it will appear, that a drought of sufficient duration to extract most of the moisture contained in that part of the soil loosened by the plough, may yet leave sufficient to preserve one plant in health; but if divided, both must suffer, for neither can penetrate the hard unstirred earth below, for a supply. But in case of long droughts, no distance whatever will insure Indian corn from suffering, when the under stratum is hard and the ploughing shallow; and under these circumstances, few summers are so wet, but that close planted corn, at some period of its growth, discovers the want of a full supply of moisture, which perhaps might be

amply afforded by one or two inches greater depth of ploughing.

Why is it, that fresh cleared land will admit of closer planting, and is more productive the second, than the first year? The surface having been for some time cleared of leaves, rubbish, &c. and exposed to the action of frost, sun and dews, that portion of earth, lying originally immediately below the black mould, and called dead earth, which was turned up by the cultivation of the preceding year (for in common soils, it is almost impossible to plough so shallow as to avoid turning up some, in new grounds) has now acquired a dark color, and therefore not known to be the same; and some of the obstacles to ploughing being removed, they almost insensibly go an inch or two deeper, without shewing any greater appearance of the yellow or dead earth, so much dreaded, than the preceding year: this furnishes a more extensive pasture for the roots of the plants growing therein, and also becomes a more copious reservoir for treasuring up moisture for the needful time; and consequently affords a supply for a greater number of plants, and consequently for a more productive crop. In deep ploughed soils, the number of plants growing therein, is not estimated so much from the extent of surface as from the quantity of soil employed, as before hinted; for instance, if one plant requires a yard square of soil, of three and a half inches depth, the same surface will be much more certain to bring to perfection two plants, when worked seven inches deep; experience having proved, that in rich deep soils, corn will admit of being planted four times closer than usual, without suffering in a drought or for want of air. Who has not thought of the pleasing idea of increasing the quantity of his land, by increasing the depth of its soil? A man who has ten acres of land, which he works

ten inches deep, will make as much or more from it, than another from twenty acres which is worked only five inches deep. What an immense saving of labor! What an immense saving of land!

4. More abundant crops. It is admitted by all farmers, that in order to insure good crops, the soil must be kept in fine tilth, and that to a considerable depth; that deep ploughing is calculated to produce both these effects is evident to all who have any experience in this practice. Deep ploughing also admits of closer planting, by which means the crop is made more abundant than it would be on the same soil with shallow ploughing. Deep ploughing also prevents the crop from being cut off by too much wet or a long drought, and frequently saves it when it is foul, when shallow ploughings would only tend to destroy it.

5. A saving of labor. One of the objections that is frequently made to deep ploughing is, the greater strength of team that will be requisite to perform it, and consequently an additional expense. This objection, I believe, on consideration, will also be found to be without foundation. True it is, that the first ploughing requires more strength of team, but then it is equally as true, that if the plough is a good one for the purpose, almost double the quantity will be performed in a given time. And as ground ploughed in this way will not acquire the same degree of firmness for many years afterwards, although it should remain untilled; it will be found that three horses to a plough will be sufficient for after ploughings, even for a grass lay; and that two such teams will perform as much in a day as six horses in three ploughs of the common kind and description of ploughing. Here then is a ploughman saved. In addition to this, it is to be remembered, that for reasons before given, land cultivated in this way, will

be preserved in good tilth with much fewer ploughings than in the other mode. Thus, let the subject be considered on whatever ground we choose to take it up, either with respect to the preservation of the soil, closer planting, the quantity of produce, or the quantum of labor bestowed, the advantages are greatly in favor of deep, over shallow ploughing.

DEEP PLOUGHING.

Continued.

No. XVI.

This subject is not yet exhausted; and if the reader feels its importance as much as I do, in considering it the basis of agriculture, and upon which all radical improvements of the soil must depend, he will attend me in the following remarks, which will conclude the subject. Another material evil that results from the practice of shallow ploughing, and which applies to all surfaces, level as well as hilly, is the injury a growing crop sustains for want of a more regular quantity of moisture in the soil: We know, by experience, that either extreme (viz. too much wet or a drought) is fatal to most of our crops; that the practice of shallow ploughing is calculated to produce both at different periods, is evident: for during a long continuance of wet, the water must stagnate in abundance about the roots of the plants, there not being a sufficient quantity of loose earth to absorb it: and on the contrary, a short continuance of drought, extracts nearly the whole of the moisture contained

in the thin covering of loose earth; and it is not to be supposed that the tender roots of plants in quest of a supply, can penetrate the compact earth below, which has never been stirred or broke up by deep ploughing. By the practice of shallow ploughing, the top soil or mould being constantly stirred, is rendered so loose and light, that if not carried off by hard dashing rains (an event which inevitably takes place on hilly lands,) is rendered dead and unproductive by being exposed to the rays of the sun, by which all moisture or nutriment of vegetables is extracted. If manures are applied to shallow worked soils, their good effects, in general, will be of short continuance, as most kinds must soon travel the road the virgin soil has gone before them.

Let us now further consider some of the advantages of deep ploughing.

Whatever manures are applied to deep worked soils, are sure to be retained; and further, if dews are nutritive, the superior openness of the texture of the soil in this mode, qualifies it to derive every advantage to be expected from that source. But, perhaps, one of the most valuable of all the effects resulting from deep ploughing is, that it in a great measure preserves an equal quantity of moisture in the soil; for, as we seldom have a rain so great as to produce an unhealthy stagnation of water about the roots of plants set in a soil seven or eight inches deep; so, on the contrary, we scarcely ever have a drought of so long continuance as to extract all the moisture to that depth:—for it is to be remembered that after a few inches nearest the surface, moisture is extracted by slow degrees. Thus it appears, from the foregoing observations, that by this mode of practice, the great loss sustained by washing, an evil so much to be dreaded in this country, is avoided; that whatever manures are applied, are safely de-po-

sited and will act with full effect; that the growing plants are abundantly supplied during the whole of their growth, both summer and winter, with an open soil, for a free extension of their roots, and also, with a regular supply of moisture, so that their growth is at no time impeded by any small irregularity of season; the depth of soil being to them, with respect to wet and dry, what the ocean is to small islands, with respect to heat and cold, the means of a tolerably regular temperature.

I can readily anticipate the remarks of our sticklers for old prejudices, on what has been advanced on the subject of deep ploughing.

This reasoning (say they) well applies to deep rich soils; but in poor shallow soils, "let him beware of the yellow clay, the dead earth, lest the value of his land proves to be the price of his too adventurous experiments." But, let me ask them, have they never seen the effects of earth taken out of cellars and wells, when applied to poor lands? Have they never observed the luxuriant growth of grass and weeds, at the edge of a bank taken from a mill race or a large ditch, and frequently on the very top when flat enough to retain moisture? For my own part, I have long been in the habit of observing these things, and do not recollect that I ever saw any earth taken from a considerable depth below the surface which was capable of being pulverized by frost or tillage, without evident advantage, even when clay has been applied to clay, and sand to sand.

Seeing this is a fact, is there any good reason for supposing that as we ascend towards the surface, such a difference will be found in the properties of the earth, that his will render the same land sterile, that the other will enrich? I confess I see none; I cannot even see, why we may not with propriety suppose, that the first six inches of earth next below the

usual ploughing, should be possessed of all the fertilizing qualities, that the same kind of earth would be, if found six feet below.

The prejudices of those against deep ploughing, have no doubt arisen from injudicious experiments. Very few farmers break up ground in the fall: in the spring their teams are often weak, and were they disposed to plough a spot of ground deeper than usual, would very likely choose to do it when wet, on account of its being easier performed, and then would plough it into a flat surface; soon after which the crop is planted or sowed, which proves the worse for the experiment, and the farmer is, therefore, disgusted with the practice; he informs his neighbors of the ill success of his experiments; and, perhaps, a whole neighborhood is thereby afresh confirmed in their former belief, that the good old way is the best —to plough as deep as they find black soil, and no deeper.

Ploughing land in *the spring*, that contains a considerable portion of clay in a state too wet to break, as the soil turns over, is thereby rendered more compact, and when hardened by the sun, becomes entirely unfitted for the production of vegetables; and is scarcely to be reduced by any succeeding tillage during the same summer; and, indeed, I believe nothing short of a winter's frost will effectually pulverize it. It must, therefore, never be forgotten, that ploughing stiff soils, when over wet, the mischief is incalculable, at least irreparable for that season. Deep ploughing a naked and poor soil into a flat surface, by which what little soil there is, is turned under, and the dead earth brought up in its place, always proves pernicious.

These cases are cited to shew, how easily the best devised system of practice, may be rendered entirely abortive, by being put into the hands of unskilful practitioners to execute. Those who wish to adopt the practice of deep ploughing with success, would perhaps do well particularly to attend to the following simple rules.

1. Ground that is to be ploughed deep, should invariably be broke up in the fall. The advantages of ploughing at this time of the year are great. The soil by being exposed throughout winter to the influence of the atmosphere—to freezings and thaws, is pulverized and rendered open loose and mellow.

The air contains the principal store of materials for the food of plants, and will impregnate the clay or dead earth turned up by deep ploughing, if exposed a sufficient length of time, especially in winter, when it receives much and parts with little; the heat of the sun being then feeble, and incapable of dispelling what the soil receives from the air.

2. Land that is ploughed deep, should also invariably be bedded, viz. thrown into high ridges with deep water furrows. The advantages of ridging are numerous.

By ridging, the surface exposed to the atmosphere to be improved by its influence, is considerably increased; it collects the existing soil in the centre of the ridge and deposits the sterile or dead earth on its two sides; and by this means, on poor land, the soil is doubled for a present crop, and the dead earth lying on the sides of the ridges is exposed to the atmosphere to be improved for a future one; thus the injury which would otherwise arise from mingling too much dead earth with the soil is avoided. I therefore do not think there is any danger in deep ploughing on the poorest soil in ridges, though in a flat surface it would be pernicious.

3. When artificial manuring attends deep ploughing, or when a good coat of weeds, grass or clover is turned under, this practice is attended with more certain success;—its advantages are greater and more immediately experienced;—as by it the manure is completely secured from evaporation—the soil deepened and fructified—and the crop growing thereon vastly increased.

4. When lands are ploughed deep, we should not be in too great a hurry to reap a profit from them, unless they are manured. Indian corn should be the first crop put on a round after it is deeply ploughed; because this crop requires the soil to be constantly stirred and exposed, which are necessary to improve the substratum turned up by this mode of ploughing.

In the course of my remarks, I have been indebted for some valuable hints to a work on deep ploughing by Thos. Moore, Esq. an experienced and distinguished farmer of Maryland, which I consider one of the most valuable agricultural treatises ever yet offered to the public. I wish it were more generally in the hands of farmers. But I have endeavored to supply this desideratum by what is contained in this and the preceding essay.

HORIZONTAL PLOUGHING.

No. XVII.

There is no improvement in agriculture which promises to be of more lasting benefit to our country, than horizontal ploughing.

Such has been the system of agriculture among us for ages past, that hilly or broken lands have been no sooner cleared, than wasted.

To test the correctness of this assertion, we need only cast our eyes over the different parts of our country, to behold thousands of acres of hilly land rendered entirely barren, not so much from the vegetable nutriment being extracted by the crops cultivated thereon, as from the soil itself being washed away and deposited in low and sunken places, creeks, rivers, &c.

What would be the consequences of such a system of Agriculture, if it admitted of no remedy or improvement? As a great part of the United States consists of hilly or broken land, the consequences would not only have terminated in the destruction of the soil; but would have extended to the impoverishment of half a nation, and even the destruction of navigation itself.

I do not, therefore, hesitate to believe, that horizontal and deep ploughing, promise to be the salvation of our hilly lands, particularly if combined with enclosing, the use of Plaster of Paris and Red Clover.

Horizontal Ploughing was first introduced into practice in this country by Col. Randolph of Virginia, son-in-law to Mr. Jefferson. Mr. Jefferson, who has frequently witnessed the great and benefi-

ial effects resulting from this practice, not only on the farm of Col. Randolph, but also on his own, thus details the mode of horizontal ploughing in a letter to a distinguished farmer of Massachusetts, and published in the Agricultural Repository:

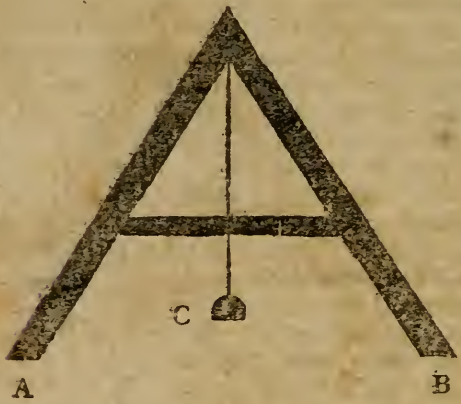
"Horizontal Ploughing has been practised here (Virginia) by Col. Randolph, my son-in-law, who first introduced it, about a dozen or fifteen years ago. Its advantages were so soon observed that it has already become very general, and has entirely changed and renovated the face of our country. Every rain before that, while it did a temporary good, did greater permanent evil, by carrying off our soil, and fields were no sooner cleared than wasted; at present, we may say that we lose none of our soil—the rain not absorbed in the moment of its fall being retained in the hollows of the beds until it can be absorbed.—Our practice is, when we first enter on this process, with a rafter level of ten feet span, to lay off guide lines, conducted horizontally around every hill side, and about thirty yards apart; the steps of the level on the ground are marked by the strokes of a hoe, and immediately followed by a plough to preserve the trace; a man, or a boy of 12 or 15 years old with the level, & two smaller boys to mark the steps, the one with sticks, the other with the hoe, will do an acre of this an hour, and when once done, it is forever done. We generally level a field the year it is put into Indian corn, until all have been once levelled: the intermediate furrows are run by the eye of the ploughman, governed by these guide lines, and is so done as to lay the earth in horizontal beds of 6 feet wide with deep hollows or water furrows between them, to hold superfluous rain—the inequalities of declivity in the hill will vary in places the

distance of the guide lines, and occasion gores, which are thrown into short beds.

"I have transferred this method of ploughing to a possession I have near Lynchburg 90 miles to the S. W. from this place, where it is spreading rapidly, and will be the salvation of that, as it confessedly has been of this part of the country.

"Horizontal and deep ploughing, with the use of plaster and clover, which are but beginning to be used here, we believe will restore this part of our country to its original fertility, which was exceeded by no upland in the State."

As many persons may not have a correct idea of the rafter level, the use of which is recommmended in this Essay, the Editor has procured the annexed engraved representation of it.



It is necessary to caution the reader, that unless horizontal ploughing be correctly done, it had better not be done at all; because I have observed that many have attempted this mode of ploughing, with-

out understanding its principles: If the water furrows, which are intended to hold the superfluous water, have the least descent one way or another, they will have the effect of throwing the water to one point, where such a quantity will be collected in heavy rains by a number of water furrows leading to the same point, as will inevitably produce a breach through the ridges. It is advisable, that before the level is applied to a field, its surface be made as even as possible; this is best done, if its unevenness renders it necessary, by flushing up the ground in the fall or winter with a mould board plough, and early in the spring to be well harrowed with a two horse harrow; this last operation will not only level the surface, but will have the additional valuable effect of breaking the clods and thereby effectually pulverizing the ground, which will prove of great advantage to the corn in every stage of its growth. The level, in this case, may be applied in the spring and the ground listed or thrown into horizontal drills for the planting of the corn. Success in horizontal ploughing depends on the exactness of the level to suspend, and the depth of the ploughing to absorb the water. Inclosing is indispensably necessary to make it beneficial, as by that, the earth is brought into a proper state for absorbing more water, and the suspension of the progress of this water by its vegetable cover, allows more time for the operation of absorption—In heavy rains, when the ground is in cultivation, and however accurately leveled, instances will occasionally occur of breaches across the horizontal beds—The remedy is, to fill them immediately with brush having the leaves on, well packed.

These instances, however, are very rare, and easily thus cured

Besides the inestimable advantages from horizontal ploughing in protecting the soil against the was-

ing effect of rains, there is a great one in its preventing the rains themselves from being lost to the crop. The Indian corn is the crop which most exposes the soil to be carried off by rains; and it is at the same time the crop which most needs them—Where the land is not only hilly, but the soil thirsty, (as is generally the case with such lands) the preservation of the rain as it falls, between the drilled ridges, is of peculiar importance; and its gradual settling downwards to the roots, is the best possible mode of supplying them with moisture. In the old method of ploughing shallow up and down hill, the rain as well as the soil was lost, which not only destroyed the upland, but rushed down and poisoned the vallies. The result of horizontal ploughing in Virginia is extremely encouraging to those who may wish to adopt this practice here. Farms there which are very hilly, whose soils were particularly liable to be washed away, and which were excessively galled and gullied, have been relieved probably of nineteen parts in twenty of those calamities by horizontal and deep ploughing in combination with inclosing.

FALL PLOUGHING.

No. XVII.

There is no operation in husbandry more indispensable, and none more neglected, than fall ploughing. That its advantages should so long have been unobserved, by its not being attended to, is not surprising, when our imperfect system of agriculture is considered. The frequent failures in making corn crops, prove that our system of farming is bad indeed; and one of the most prominent causes of these failures, is the neglect of fall ploughing. I am confident in saying it, that were farmers in the habit of breaking up their corn ground deep in the fall, or early in the winter, that rarely a year would occur in which the most abundant crops would not be made.

The following are some of the advantages of fallowing land in the fall, preparatory for a corn crop to be planted thereon the next or succeeding year.

1. By turning under a cover, of weeds, clover or grass, which are deposited so deep as to be beyond the reach of evaporation, and which by their gradual putrefaction, fertilize the soil.

2. By breaking up the ground deep in the fall, to be exposed throughout winter to the influence of the atmosphere, its texture will be much improved, as the expansive powers of ice, the gradual dissolutions of snows, and the alternations from wet to dry, tend to pulverize it and to mix its different parts more intimately together.

3. By destroying grubs or cut worms, so destructive to young Indian corn—While various methods have been devised and recommended to destroy the cut worm, which are tedious and uncertain, the true

one has been entirely overlooked. In all instances where fields have been fall ploughed, harrowed in the direction of the furrows, and if, in addition to this, lime has been spread to lie over winter, no grubs have disturbed the young corn.

The field must be wholly ploughed, otherwise a nursery is left for the grubs, sufficient to spread over the ploughed part, in that remaining in the sod.—The fact is indubitable, and the reason is obvious. The beetle seen through the summer rolling balls of cow-dung and depositing them in the ground, thus protects its progeny; which issue out in myriads in the spring and destroy the young corn and tobacco plants. Plough up your ground in the fall, harrow it, and expose the nurseries of vermin to the winter frosts, and you insure against their mischiefs—Lime in addition (though it may be dispensed with) completes their destruction.

4. A saving of labor. When corn ground is not broken up until spring, the farmer is frequently compelled to do it when the soil is not in a proper condition for the operation. The rains that generally fall throughout winter, and the melting of snows in the spring, so completely saturate the soil with moisture, that the farmer is compelled to break up his land in balks, or lose the chance for a crop; for to wait until the soil is sufficiently dry to plough to advantage, would bring him late in the spring. Hence he is under the necessity of giving several additional ploughings, to break the balks after the crop is planted, and the injury which the land receives by being broken up too wet, is much greater than many are aware of, and such as is not soon repaired or remedied.

But, by breaking up ground in the fall and early in winter, as is herein recommended, it is done at a season of the year when the vegetable matter which

covers the surface is in a proper state to be turned under, and the soil in a good condition for ploughing and breaking up freely; and by being exposed throughout winter to the influence of ice and frost, the soil, by spring, will be in a fine loose, mellow condition, however cloddy it may have broke up.—You will thus have your ground ready for planting in the spring; and what is infinitely of greater advantage, you will have plenty of fine mould to nourish the roots of the young corn, and thus give it an early start in growing—advantages which are of the utmost importance in the cultivation of this crop, and which no spring ploughing, however well done, could possibly give.

In this case, the crop will not suffer much by grass, even should wet weather in the spring prevent its being worked, as the deep ploughing in the winter buried their seeds too deep to make much appearance: and a considerable saving of labor will be effected in the ease with which the ground will be worked, owing to its lightness or mellowness, and in not requiring much stirring.

The advantages of fall ploughing on land inclined to be wet, or on flat marshy land, as preparatory to a corn crop to be planted thereon the succeeding year, are also very great, so much so, as to insure more than a double crop to what would be made if the ploughing is put off 'till spring. Land of this nature, from the worst, is capable, by skilful plough drainings in the fall, of being converted into the best of our soils. This is to be effected by ploughing the ground into high ridges and deep furrows; the wider the ridge, the deeper the furrow may be made, and in ridges calculated for Indian corn, which may be five and a half or seven feet wide, the bottom of the furrow may easily be made fifteen inches lower than the top of the ridge. In case of a descent, the

deep water furrows will serve as drains to convey off the stagnant or superfluous water; and even on a dead level, the deepness of the furrows will relieve the ridges above of a saturity of moisture, and by being exposed to frost, will become sufficiently dry and friable by spring for the corn to be planted thereon—It is in this way that even the most sour, harsh and infertile clay soil, may be made to produce good crops; for it has been found that nothing confers so great a benefit upon this kind of soil, as by being ridged up and exposed to severe frost; ridging it up is essentially necessary, because if ploughed into broad flat lands, this kind of soil has a tendency to consolidate or bake, which the former practice will prevent by drying and draining.

To test the utility of fall and early winter ploughing for corn, let one half of a field be broken up at this season, and the other half remain unbroken till spring. The fall ploughed part will exhibit by far the best crop, will work easier and lighter throughout summer, have less grass, and will appear in comparison with the other as if it had been manured.

GRASSES.

No. XIX.

The judicious cultivation of grasses, though the least expensive and the most profitable part of husbandry (for on it every other part may be said to depend) has hitherto been too much neglected by the generality of our farmers, and in this they have been blind to their best interest. In order to be successful, a farmer should endeavor to procure and cultivate such grasses as are peculiarly adapted to the various soils, of which his plantation is composed; so that every spot, from the dryest hill to the wettest swamp, may be employed in yielding him profitable productions. Nothing more betrays the imperfect system of agriculture existing in North Carolina, than the almost total neglect of cultivating artificial grasses. Not even red clover, which stands at the head of them, has, as yet, been introduced to ameliorate or improve the soil. By a neglect of this, with other grasses, our lands are not only in an impoverished state, but our live stock, particularly cattle, are felt as an expense, instead of a profit.—By the present mode of management, the stock are principally supported from the corn-house, aided by the coarse offal of the corn field, and at more than double the expense that they might be by a proper attention to grass. A meadow of a few acres would be found, by every farmer, of more real value to him in the support of his stock than every other resource which he possesses: and, instead of keeping them poor, as he now does, in winter, by an insufficient supply of food, and of turning them out in summer on pas-

tures thinly covered with a natural and coarse herbage,—he would, in the former season, have a plentiful supply of hay for them, and in the latter luxuriant grass, by which they would be kept fat, and thereby made a profit, instead of an expense.

In every part of the union where agriculture is confessed to be conducted upon improved principles, the cultivation of artificial grasses is an object of primary importance with the farmer; so much so, that their cultivation is embraced as a part of every good rotation of crops.

In Pennsylvania, the introduction and general cultivation of artificial grasses, particularly red clover, has added millions to the wealth of her farmers. A Pennsylvania farmer, who knows the advantage of a timothy or clover meadow, considers it a folly to spend time in collecting corn blades.

The time is fast approaching, when the farmers of North-Carolina will be awakened to their better interest with respect to the cultivation of grasses.—They will discover, that whether they cultivate Wheat or Tobacco, it will be necessary, and highly to their interest, to combine with them, by degrees, highland meadows, hay and meats, for market.

The price of meat and draft animals is increasing, and will increase whilst our agriculture is in its present state.

There are a great number of artificial grasses which are more or less valuable according to the soil and climate in which they are cultivated. But their number and variety are not so essential, as a correct selection from among them.

I shall proceed to describe such grasses, as, from experience and observation, appear to be best adapted to the soil and climate of North-Carolina, which must always be kept in view in treating on this subject.

Red Clover.—This is the most valuable of all the artificial grasses. No other grass can compete with this for the prompt amelioration or improvement of the soil—aided by plaster, it does every thing for exhausted lands; and much for any other soils. It yields a hay, not surpassed by any other grass in abundance, or in nutritive and wholesome qualities.—But as red clover has already been fully treated of in a former number, to which the reader is referred, it is needless to enlarge on it here.

Timothy.—This is a well known, favorite and native grass of the northern and middle States. Timothy succeeds best in a moist low ground; it is well calculated to improve moist meadows overgrown with moss. The best way of sowing it upon such lands, is immediately after they are cleared and drained. On uplands, it is best sown with red clover, as this mixture makes the best hay; another advantage of sowing them together is, that the timothy will answer to support the clover should it be inclined to fall or lodge. When, however, it is sown with grain, no clover seed should be mixed with it; but may after it is cut, be mixed with the clover hay in alternate layers.—When sown with grain on uplands, it will be sheltered from the sun until after harvest, when it will have acquired sufficient strength to bear the heat of our summers.

The first year, after grain harvest, it may be lightly pastured, but the second year it must be kept up for hay, of which it will yield an abundant crop, if the ground has been well prepared.

Timothy should not be cut until in full blossom, or not until the young leaves be seen coming out from near the surface, which, if the grass be then cut, will start up with vigor, stand the sun, and yield fine pasture. If it be cut too early, or before it is in

full blossom, it is apt to bleed, which weakens the stalk, and frequently occasions the death of the plant.

On uplands, the average crop of timothy hay is about two tons—on moist lands or on those which are irrigated or flooded, the product is far greater. Timothy yields an abundance of seed, at least from twenty to thirty bushels to the acre. But this grass is so generally cultivated and known, that it is superfluous to enlarge on it.

GRASSES.

Continued.

No XX.

Orchard Grass.—This is among the most valuable cultivated grasses for uplands, in this or any other country. It is permanent, grows luxuriantly even under the shade of trees; and hence it is called Orchard Grass. It springs quickly after cutting, yields plentiful pasture, and those who know it best, prefer the hay to any other. It is, on uplands, preferable to timothy; which is a great exhauster,—yields but one crop of hay, and little or no pasture, on dry soils; thus leaving the field bare of cover; and exposing it to the exhaustion of the sun and winds: whilst orchard grass, by its quick and repeated growths, affords a ceaseless cover and defence. This grass will be permanent, when clover, (with which it is a profitable companion) fails.

All beasts are fond of it, both as pasture and hay. Any soil is suitable for it, if not wet: all high and

dry soils are well adapted to it; but a sandy loam of good staple is the fittest.

This grass should be cut for hay as soon as it is completely in head and blossom; if it stands for seed, the leaves fall, and the stalk grows rigid and worthless. No crop yields more abundantly and profitably than one of this grass raised merely for seed. But the grass is discredited by those who aim at too much. They suffer it to stand to ripen the seed, and thus ruin the hay.

When seed is intended to be raised, a spot or patch of it should be exclusively devoted to this purpose, and not cut for hay.

When gathered for seed, it should be tied up in small bundles; a few strokes over a barrel, when the heads are sufficiently dry, (like detaching the seed from flax,) will disengage all the seed, and leave the chaff. Orchard grass is extensively cultivated in Pennsylvania and also in many parts of Virginia; it would be found to succeed equally well in North-Carolina.

A distinguished farmer* of Pennsylvania observes, "I know the value of Orchard Grass and can vouch for its superior qualities; having constantly sown it for a period of 40 years. I generally sow it on my wheat in the autumn, covering the seed (1 bushel and a peck to a bushel and a half, per acre) with the last harrowing. Some sow it in the spring, but I prefer the fall. Much depends on the soil and season, and both periods can be tried, to enable the farmer to form the best opinion. I sow on the wheat in February or March, about six pounds per acre of red clover; and these plants are ready for the scythe at the same time. The orchard grass should be cut

* Judge Peters.

for hay when the panicles are fairly formed, and this is about the time when the heads of the clover begin to turn."

This grass is apt to grow in tufts or tussocks if sown too thin; to remedy which, a plenty of seed should be allowed. Great impositions may be practised in selling orchard grass seed—so that frequently chaff fills the bushel, and the price deters its general use. It should be sold by weight; and in this case, the chaff sellers would be disappointed, and the buyers of seed would be fairly dealt by. It is far best for farmers to raise their own seed; as none can be raised more easily nor abundantly. A small patch would make a great turn out. The English name of Orchard Grass is Cocksfoot—the Latin or Linnean, Dactylis Glomerata.

Tall Meadow Oat—Sometimes called "Egyptian Oat" and the "Peruvian Grass." The qualities of this grass are, to produce heavy crops of fine hay in strong land—to bear drought better than any other grass—to live in land where red clover perishes, and to afford to it cover and vegetable matter—to bear grazing well—to adhere long to the land—and to yield both good seed and good hay at the same cutting. The greatest defects attending this grass are, its propensity to grow in tussocks, and to shed its seed while yet green. The former may be remedied by sowing it thick, and the latter, by cutting it at the proper juncture for the sake of securing seed.

Stocks of all kinds graze well on the meadow oat, though when mixed with red clover, they prefer the latter. Hogs are most pertinacious in this preference. It bears grazing better than any other grass, and more frequent repetitions of it, allowing it short intervals to spring up, after being eaten down. It affords, after being well set in strong stiff land, grazing nearly or quite through the winter. Cut after it

is in flower and before the seed ripens, it makes fine hay; and good after a portion of the seed is ripe.—The tops being clipt off with a sickle for seed, the residue will make tolerable hay; and this is the best mode of saving seed. As soon as it springs after being cut, grazing may be commenced upon it and continued until March.—Observation will determine the rest it requires. But it should not be grazed whenever the ground is so wet as to admit of being poached. It holds the ground longer, and resists intruders more vigorously than any other highland grass.

It is an excellent grass to be sown with red clover, by rendering the hay more easily to be cured. It may be sown with oats or wheat, or alone. Its power of resisting drought, and preference of highland, and capacity of existing in sandy soils, peculiarly adapt it for the soil and climate of North-Carolina, where it would prove a valuable acquisition on every farm.

GRASSES.

Continued.

No. XXI.

Guinea Grass.—This grass is as yet little known, as it has been only partially cultivated in the United States. But the few experiments made in its cultivation, have succeeded so well as to prove that it is well adapted to the soil and climate of the Southern States. It has been proved to yield a quantity of grass and hay, almost exceeding belief. It merits the particular attention of the farmers of North-Carolina; for should it be found to succeed well in this State, it would prove of more real value to them than the discovery of a gold mine. The writer has made several fruitless attempts to procure some of the seed of this grass; he means still to persevere in his exertions, and with the view of inspiring others with the like desire of introducing this valuable grass among us, and of interesting them in its favor, the following account of it is given, as taken from a communication addressed by Dr. S. Brown of Natchez, M. T. to the Philadelphia Agricultural Society.

'Six years ago, I saw one or two plants of the Guinea Grass, in the garden of M. Treme, near the city of New-Orleans; but as I was, at that time, in no way concerned in agricultural pursuits, it attracted little of my attention. Last autumn, I again met with it, in great perfection at Mr. Munson's a few miles north of Fort Adams. Although Mr. Munson had not more than half a dozen plants, he obligingly furnished me with a pint of seed, which I shared with my friends in this territory, Kentucky, and in Tennessee.—Having determined to cultivate this

grass, I sought for information on it from such books as were within my reach. In Bryan Edward's history of Jamaica we have the following account of it.'

"Guinea grass may be considered as next to the sugar cane, in point of importance, as most of the grazing farms throughout the island, were originally created, and are still supported chiefly by means of this invaluable herbage. Hence the plenty of horned cattle both for the butcher and planter, which is such, that few markets in Europe can furnish beef at a cheaper rate or of a better quality than Jamaica. It thrives on the most rocky parts of the island, bestowing verdure and fertility on lands which otherwise would not be worth cultivation."

'From Willich's Domestic Encyclopædia I make the following extract.'

"Guinea grass, a valuable species of herbage, thus denominated, as it was first discovered on the coast of Guinea, whence it was brought to Jamaica and afterwards imported into this country, (England.)—About 10 years since, it was introduced into the East Indies, where it is now successfully cultivated, and grows to the height of seven feet; it admits of being frequently cut, and makes excellent hay: cattle eat it both in a fresh and dry state with great avidity; hence the culture of this valuable herbage has been strongly recommended to the farmers of Cornwall and Devonshire."

'The subsequent remarks on the culture of this grass, are by the late Henry Laurens, of South-Carolina:"

"In the last spring I procured from Jamaica three half pints of Guinea grass seed, which I planted in drills of one fourth of an acre of *very indifferent land*. The seed sprung, and soon covered the ground with grass, four feet high and upwards. Being desirous of saving as much seed as possible, I cut one-

bundle of grass for horses; they ate it all with great avidity. In August I took one of the grass roots and divided it into twenty-eight parts, which were immediately replanted; every part took root, and the whole are now growing very finely,* and seeding.

"I am of opinion this grass will make the best pasture we can wish for. It is easily managed, requires but one good hoeing, after which, it will take care of itself."

'With this stock of information, I commenced my experiments. In the month of April, I prepared a piece of ground in the city of Natchez, and planted the seed I had reserved for myself, in holes two feet distant from each other.

'When the plants attained such a size as would admit of it, I took them up, and dividing the roots, set them out when the soil was wet, and in this way filled up the ground I had appropriated to my experiments. I did not begin to cut the grass until the 16th of July, I then weighed the produce of one seed, in the presence of a number of gentlemen, at Mr. Robinson's hotel in Natchez. One hundred and sixty-four stalks, from six to seven feet high, growing from one root, weighed together 30 pounds — At Mr. Winn's tavern, on the 10th of September, a *second cutting* from one seed, weighed 35 pounds. The number of stalks was 184, some of which measured 10 feet 11 inches in length. Some parts of the lot in Natchez is very poor soil, and the grass on those places did not grow higher than six or se-

* It is curious to calculate the quantity which an industrious planter can obtain from one seed. Suppose that each of the 28 divisions of the root produced less than one half of the number of stalks I obtained from one seed, for instance 50 stalks, this will give 1400 stalks in one season from a single seed.—On a good soil, in a favorable year, these will attain the height of at least seven feet. Note by Dr. Brown.

even feet. But on a good soil, in a favorable season, in this climate, I am persuaded it is a very moderate estimate to allow to every square yard 10 pounds at a cutting, when we cut only three times in the season. This would give 30 pounds to every square yard, or 147,000 pounds of green grass to the acre. But this production seems so enormous, that I should not have ventured on such a calculation had I not the respectable authority of Mr. Edwards to support me. He asserts that the Scots grass, which he seems to consider as far inferior to the Guinea grass, is so productive that one acre of it will support five horses the whole year round, allowing each horse 56 pounds per day, which is 102,200 pounds per acre. Admitting that my calculations are extravagant, let us suppose that an acre will produce one third of what I have stated, still we must consider Guinea grass as the most valuable of all the known grasses.

At Pereyfield, near Fort Adams, Mr. Oglesby, my manager, planted about the *eighth of an acre* of very fertile land, with plants obtained from Mr. Munson, in the first and second week of May. They grew without any trouble, except that of cutting down the first growth of weeds. On the 29th of June, he began to cut it for the use of the plough horses and mules; and this small quantity of ground continued to supply them with as much as they could eat of it, during the whole summer. On the 5th of September, he wrote me that he had cut it *four times*. From 20 roots he obtained at the fourth cutting 250 pounds of green grass, and in two weeks he would cut it the fifth time. I find no difficulty in collecting the seed; I have already obtained a bushel in return for three or four spoonfuls, which I sowed on my lot in town—I cut off about two feet of the top with the panicle, as soon as the seed begins to fall, and after it is dry comb out the seed with a coarse comb.

As the seeds vegetable very slowly, the most certain mode of obtaining young plants would be to prepare the ground and sow the seed as the cultivators of tobacco do tobacco seed. As soon as the plants have attained the height of two or three inches, and when the danger of frosts is past, they should be removed to the ground where they are to stand, where they readily take root.* A rich black mould, and a soil somewhat moist, I think produces the most luxuriant grass, but I have had very little experience as to the soils to which it is best adapted. I hope that before many years, it will be tried in every climate in the United States, and on every variety of soil. No kind of grass with which I am acquainted, supports the heat of the sun so well; and this property, was it even less productive, would recommend it to the notice of the agriculturalist, for, from the first of July, until it is killed by the autumnal frosts, it will afford a *constant*, and an abundant supply of green food, and consequently enable the farmer, whatever may happen to his other meadows, to lay up a plentiful stock of hay for the winter. The hay is uncommonly fragrant, and horses prefer it greatly to the best corn blades.'

'If Guinea grass succeeds as well with others, and in every season, as it has done this season, with me, and as it has done in the West Indies for more than half a century, the planters of the south will have no reason to envy their northern neighbors their luxuriant clover pastures, or their numerous ricks of ti-

* There is no more difficulty in transplanting it, than in planting cabbage or tobacco. A bushel to [illegible] of the [illegible] will be sufficient for an acre. One hundred plants would enable a poor family to keep a cow [illegible] a horse with food all summer. How much would the general cultivation of this grass add to the comfort of the poor and middling classes of society.'— Note by Dr. Brown.

timothy hay. If Guinea grass is substituted for clover, timothy and luzerne, at least seven eighths of all the grounds appropriated to those crops will be given to the cultivator for the purpose of raising sustenance for the human species. To what amount this change will increase the sum of national wealth, I leave to those to estimate, who are more conversant with such calculations.'

GRASSES.

Continued.

No. XXVI.

Herds grass.—This grass is best adapted to wet reclaimed meadow land; yet it succeeds well on all land that is low, and rather wet; it mats and consolidates the surface, so as to render it firm and dry, which was before wet and miry. It will also grow well on level stiff high land. It makes excellent hay, and is better for this purpose than for grazing; yet all cattle are extremely fond of it, and it answers well for late and early pasture. Horses will rather prefer herds grass hay to that made either of clover or timothy. It is more succulent than timothy, though not so coarse. The same bulk of herds grass hay will weigh one third more than the same bulk of timothy hay. Four tons is a common crop from one acre. As it yields no second crop of hay,

in the same season, it may after it is cut be severely grazed until Christmas.

There is no other artificial low land grass that continues longer in the soil, or is more tenacious of its hold than this; it may be sowed in the fall (which is the best season) either upon wheat immediately sown, or among corn, the ground being first put in fine tilth. In both cases, it is better to cover it as lightly as possible, or in both it may be left uncovered to the guardianship of the weather with success. Sown mixed with timothy, a better crop may be expected the first year, but it will gradually eat out the timothy; and it has been good and thick for eight years after every stalk of the timothy has disappeared. In the New England states, farmers more commonly mix red clover with herds grass when they stock land. It makes the crop stand up better and cattle seem to like the mixture better—The proportions commonly are six pounds of clover and two quarts of herds grass. Herds grass makes both good seed and hay at the same cutting, so that an abundance of the former can be saved with little expense. Hence the quantity sown on an acre, is not important, because grass seed cannot be sown too thick. Could it be cleaned of the chaff, a peck would amply suffice for an acre, but as this is difficult, a bushel would not be too much. If the seed is cleaned of the chaff, from six to eight quarts will be sufficient for an acre—from four to six will do well in a good soil.

The seed of this grass is cheap and easily produced. Every farmer can raise his own, by letting a piece of it get ripe and reaping off the tops as directed in the case of tall meadow oat grass.

Herds grass claims the particular attention of all farmers who have low, fat or moist lands;

there is no other that would prove of so much value on such land, and it is one that should be cultivated by all those who aim at success in agricultural pursuits.

Red Top.—The red top is a variety of herds grass, and they are in many places called the same. Red top, like herds grass, is peculiarly calculated for low, wet, swamp land—it will grow and sod the first year and will give stability or firmness to the most miry soil, as it grows so thick as completely to bind the soil. Hence it is best adapted to such land as is not fit for the plough, and on such it will be found a rich and durable grass. It is sown and managed like herds grass.

The following remarks will close our observations on grasses.

First. Land should never be laid down to grass, until it be put in fine tilth and be well cleaned of weeds by a proper course of crops. Such crops should be adopted for this purpose as require the soil to be constantly stirred, particularly with the plough: unless this rule be attended to, grass fields will become foul and overrun with weeds, before the grass can become well set or rooted. It is difficult to keep an old weedy farm long in grass; and the plough must be oftener used than a clean farm requires. If land is well cleaned, by adopting a proper course of crops for the destruction of weeds and other pests and two dressings of manure be applied to the grass, it will flourish for many years if it be of the permanent kind, and yield fine hay and pasture.

Second. Land should not be kept too long in grass. No grounds should continue in grass until they become hard, bound, and consolidated, and the roots become old and matted; for good crops of grass can

be no longer obtained, than while the soil continues free and open, and the roots remain unimpaired.

When the old sod is broken up, time, as well as preparation by proper courses of crops, must be allotted. No kind of small or winter grain should be sown the first season of breaking up old grass grounds. The stirring and culture of that and the ensuing year, are necessary to ensure the complete destruction of weeds and other unprofitable vegetables.

Third. The practice of cutting artificial grasses in the growing season for stock, instead of being grazed, is attended with many advantages. One acre of grass cut green and given to working beasts and cattle, will go as far as three acres grazed;—because in the former case the grass is less injured when cut, than when torn or jagged with the teeth of the cattle, and much is wasted by being trodden down. They are likewise in the former case obliged to feed without making selection, and in consequence the whole food is consumed. It is remarked by the most celebrated writers on agriculture, that experience only can teach or warrant the belief, of how few acres of ground, under the culture of artificial grasses when cut and daily given to working horses and cattle, will suffice to their nourishment.

Fourth. Not only Red Clover, but every species of hay, should be well salted. All kind of stock will prefer inferior food thus treated, to the finest hay in its raw state: for the salt assimilating with the juices of the hay, prevents too great a fermentation, and imparts a superior flavour. Further, the salting of hay effectually secures it from becoming overheated or mildewed in stacks; so that the hay may be put together, without the least dan-

ger of firing, in a much greener state than would otherwise be safe.

But oversalting diminishes the nutriment. More than a peck to a ton is injurious. Half that quantity is often sufficient. Ten to fifteen pounds is usually an ample allowance.

Fifth. In laying down land to grass, the mixing of different grasses is highly to be recommended. Nature has provided in all permanent pastures a mixture of various grasses, the produce of which differs at different seasons.—Where pastures are to be made artificially such a mixture ought to be imitated; and, perhaps, pastures superior to the natural ones may be made by selecting due proportions of those species of grasses fitted for the soil, which afford respectively the greatest quantities of spring, summer, fall and winter produce.

THE ADVANTAGES OF GOOD TILLAGE.

No. XXIII.

There are certain fundamental-principles of good tillage, with which every part of rural practice is more or less connected. They are the same in all climates, and in all situations, and these I consider to be as follows:

First, That the soil should be laid dry, or free of all superfluous moisture.

Secondly, That it should be kept clean, or free of all noxious weeds.

Thirdly, That it should be kept rich—that is to say, all the manure that can be made or collected, should be so applied as to keep the soil in a state capable of producing good crops.

Without laying land dry, neither the advantages of good ploughing, nor the benefits arising from manure can be fully obtained; if either of the other principles are neglected, similar defects will necessarily ensue; but when they are well acted upon, when the land is kept dry, clean and in good heart, and a proper system of rotation of crops is pursued, the husbandman may expect a suitable reward for his labor. In a system of good tillage, every part of a farm should be in a cultivated or productive state. All swamps and marshes should be cleaned up and drained, also all other wet and low places, and converted either into tillage or grass. Without draining such land, the greatest quantity of the best manure will prove ineffectual; the stagnant waters will corrupt the natural nourishment, so essentially necessary to produce sweet herbage; but when the cause is removed, the effects will cease. The low-

uriant, noxious weeds, or coarse grass, being deprived of their nourishment by draining, of course die, and sweet wholesome herbage naturally succeeds without manure. An important principle of practical husbandry, is cleanly farming. A good farmer must suffer nothing to grow, but his crop. He must therefore use ceaseless endeavors to exterminate weeds and pests.

However small may be the attention to this salutary maxim, it is the foundation of all profitable operations in husbandry—the test of character in the agriculturalist—and should be the pride and boast of all respectable husbandmen.

One being asked—"what was the best manure"? replied—"animal sweat"—Meaning good tillage, industry, and intelligent and repeated culture. All these are hostile to weeds and pests; and certain modes of destroying them.

In the cultivation of the earth, such a rotation of crops should be adopted as is best calculated to enrich the soil with abundant manure, to preserve it best from weeds, to prevent it from washing and keep it in good heart. A good rotation of crops has been found, in all well cultivated countries, to improve the soil, instead of impoverishing it. In every such rotation red clover is an essential article. The rapid improvements in agriculture, which have taken place in our country, particularly in Pennsylvania, for the last fifty years, may, in part, be justly ascribed to red clover, aided by the almost magical fertilizing power of plaster of Paris, by which more wealth has been introduced than would have resulted from the discovery of a gold mine. But ours is not the only country which has been benefited by this system. "In England, besides the systematic attention bestowed on manures, the social and life of agriculture, they have derived equal advantages from a

steady rotation of crops, the system of trench ploughing, &c. to this course—and more frequent and deeper ploughings, also the fortunate introduction of red clover from Flanders about 100 years ago, England owes its pre-eminent standing as an agricultural nation."

All spots within the inclosure of a farm which are too barren or steep for the cultivation of any kind of grain crop, should be laid down into profitable grass land so soon as that can be properly accomplished. A skilful and intelligent farmer, in pursuing a system of good tillage, should suffer no part of his farm to lie waste, but should make it produce something towards the support of animal life, and thus attain the character which every farmer should aspire to, that of bringing the entire surface of his farm into the best considered use by prudent and appropriate cultivation.

But our misfortune is, we have too much land—the consequences, generally speaking, are wretched husbandry and half crops: our farmers push a good soil till it is impoverished, and cultivate in an imperfect manner extensive tracts, a small proportion of which, if properly managed, would yield them more and better produce.

It is high time that we should cease to employ labor in killing land, and that we should turn our attention towards its improvement, by cultivating less at a time. By cultivating less land we shall be enabled to do more justice to it, and to render our labor more effectual, and consequently more profitable. We shall till it better, manure it better, keep it in better heart, and what is lastly not to be disregarded, make more abundant crops.—When a smaller quantity of land is cultivated at a time, the farmer will be enabled to apply to it, what should be applied to all cultivated land, faithful tillage, and faithful manuring. All the ope-

rations of agriculture may be comprehended in these two simple and efficacious principles.

These principles, since they have been pursued, have produced a new æra in the cultivation of the soil, which may be called the æra of systematic Agriculture. Man, taking the earth in its exhausted state, or from nature's hand, bare of manure, has so managed and disposed it artificially, that it has yielded him first a subsistence, and then an overplus to grow wealthy upon.

How far it may go in this species of improvement, is yet unknown, as the ultimatum or fertility has never yet been established. As far as experiments have been made, we find the earth liberally affording its produce, in proportion as faithful tillage and faithful manuring have been bestowed upon it; and as the ingenuity and invention of man may increase to an unknown and inconceivable degree, so may the improvements and arrangements of husbandry keep pace therewith, until the most fruitful spot that now exists, may produce a tenfold quantity, and the land which now supports an hundred men, give employment to a thousand. Recollect, for instance, what agriculture has done for some parts of our country within the last fifty years. Lands which were then in a state of sterility and unbounded wilderness, are now, by the well-applied skill and industry of man, in a high state of fertility and improvement, and affording subsistence, wealth and happiness to a numerous and thickly settled population.

THE ADVANTAGES OF GOOD TILLAGE.

Continued.

No XXIV.

The difficulty of procuring manure in sufficient quantities, ought to teach the farmer to use it in the most economical manner; much of his manure may be saved by good tillage. Ground well tilled will not take half the manure for a crop, as ground of the same quality badly tilled. There can be no doubt but pulverising the earth in most soils, answers the purpose of manure in a considerable degree. Mr. Tull, who was an ingenious writer on husbandry, carried his theory so far as to suppose that the division of earth by tillage, would answer every purpose of manure, and that dung only separates the parts of the earth, and that it is immaterial whether this is done by the plough or other instrument of husbandry, or by dung.

Although I cannot subscribe to this theory, yet there is no doubt but good tillage is very essential, and when combined with manure, gives it a treble effect in the increased production of crops. The finer the parts of the earth are made, the better; this we constantly experience in our gardens, and the same advantage would take place in our fields. The dews absorbed by the earth when made fine or pulverized, and the nitre which adheres to it, add greatly to vegetation. It is found that the fine dust in the streets, in a dry time, is so impregnated with nitre, that it will make salt petre. Too much attention cannot be given to prepare a field for a crop; the finer the earth is made, (a good depth) the more dews and salts it will receive and retain. It is well

known to farmers, that the best tilled lands, or those lands where the parts are made the finest, bear a drought much better than lands poorly tilled; and the best ploughed and hoed Indian corn always bears a drought best, because it is prepared to receive and retain the dews and salts of the atmosphere, which enrich the land, as well as promote vegetation.

The horizontal roots of every kind of crop cultivated, have seldom any of their branches deeper than the plough or spade has penetrated into the staple of the earth. These roots sometimes extend themselves several yards from the main or tap root. Roots by being broken off near the ends, increase their number, and send out several where one is broken off. Roots increase their fibres every time the earth is stirred about them. Stirring the earth causes a more rapid growth.

I call the inner superficies, made from dividing the soil by art, the artificial pasture of plants. This artificial pasture may be enlarged for the roots of plants without the addition of any more land, in proportion to the division of the parts of earth, and this division may be carried on without end.—Suppose a solid cube of earth of one foot, too hard to be penetrated by the smaller fibrous roots of plants, it is obvious enough, that by its entire pulverization, it will afford to these roots, which have penetrated it in all directions, a surface more than a thousand times greater.

Every time the earth is broken by any sort of tillage, there must arise some new superficies of the broken parts, which never have been opened before. Great part of the use to plants except by the dust they collect: when pulverized, the particles are exposed, to be impregnated throughout their whole substance with the riches carried in by the dews. As soon as the farmer has done ploughing and harrowing, in the

usual mode of culture, the particles of the soil will tend to unite again by their specific gravity, and by little and little close up, and become impervious to the finer roots of plants. This will take place, in a greater or less degree to the depth the plough had penetrated. This tendency cannot, it is well known, be effectually counteracted by the use of the hand hoe. Hand hoeing is only scratch hoeing. But the plough keeps the magazines of the earth open, and replenishes them with the dews, which fall most in dry weather, and these dews seem to be the richest present the atmosphere gives to the earth, and having when putrefied in a vessel, a black sediment at the bottom. This seems to cause the dark color of the upper part of the ground. To demonstrate that dews moisten the land when fine, dig a hole in the hard dry ground, in the driest weather, as deep as the plough ought to reach; beat the earth very fine, and fill the hole therewith, and after a few nights dews, you will find the fine earth become moist at the bottom, and the hard ground all round will continue dry. Or two fields—make one very fine by frequent deep ploughing; and let the other be rough by insufficient tillage; then plough the two fields crossways in the driest weather, (when of long continuance) and you will find ploughed land, on its being turned up, moist, the other dry as powder from top to bottom.

As fine ploughed land is not so long soaked by rain, so the dews never suffer it to become perfectly dry: this appears by the plants which flourish and grow fast in this, whilst those in the hard ground are starved, except such of them as stand near [illegible] to draw moisture [illegible] ploughing produces [illegible] it lets in the [illegible], and therefore [illegible]

afraid to plough or hoe their plants in time of drought, when they are spoiled for want of it.

There is yet one more benefit from ploughing thoroughly and frequently. All that can be done in feeding an animal is to give it sufficient food, meat, and drink, at the times it has occasion for them. If you give an animal any more, it is to no purpose, unless you could give it more mouths, which is impossible; but in ploughing deep, near and round a plant the additional nourishment thereby given, enables it to send out additional, innumerable fibres and roots, which fully demonstrates, that a plant increases its mouths in some proportion to the increase of food given to it. If it be asked, how many ploughings are necessary? I answer—it is not the number of ploughings that determines the degrees of pulverization. For one well done is twice done; and the oftener the better, if convenient. Poor land should have the most ploughings; because plants receiving very little nourishment from the natural pasture of such land require the more artificial pasture to subsist upon.

Columella relates a story finely illustrative of the advantages of good tillage, which, though short as it is, contains a volume of instruction.

"A certain Publius had two daughters and a farm planted with vines. Of this farm he gave one third part as a marriage portion, to the man who wedded his eldest daughter, and notwithstanding, received as much produce as before, from the two thirds which he reserved to himself. Afterwards, on the marriage of the younger daughter, he gave away the half of the remaining land, and found his income still in no respect diminished. What concludes he from this? But that the *third part* of the farm was

at length better cultivated than the whole used to be before.

About two hundred years since, great efforts were made in France to revive the arts of husbandry.—The Flemings, about the same time, made similar efforts. They endeavored to conceal from their neighbors, their discoveries and improvements—*They reduced the quantity of arable land, increased their manures, ploughed deeper and oftener*, and kept their tillage grounds *perfectly clean like gardens.*—They soon found that ten acres of ground, well manured and well cultivated, would yield more than forty acres by their previous mode of cultivation.

PLASTER OF PARIS.

No XXV.

This valuable manure, when first introduced into agricultural use, met with great opposition in the prejudices of farmers; but its great and beneficial effects upon almost all kind of grain and grass crops, have been so fully established by the experience of thousands, that it is now eagerly sought after and used in every part of the country where its valuable properties are known, and it can be obtained. Its use in agricultural purposes is now rapidly extending, and no better proof of the improvement of any agricultural district can be wanting, than the evidence of a free use of Plaster of Paris—In proportion as agriculture and interior navigation are promoted, so will the use of this substance extend, until the time will arrive when it will be generally used

to every part of our wide spread country. May we not, in the improvement of our rivers, speedily look for the introduction of this valuable substance among the farmers of North Carolina? They surely will no longer withhold from their use this great auxiliary to their agricultural prosperity? With the view of encouraging its introduction among us, the following information is given, by way of direction in its use. This information is entirely practical, it being the result of the experience of the best farmers of all our country who have used the Plaster on an extensive scale, for a number of years in different soils and climates.

Query 1. What soils are the most proper for this manure?

Ans. The soils most proper for this manure are warm, kind, loamy ones: land that is generally deemed good wheat land—that will sink the water quick in winter—land not too level—land that takes lime well, will take the Plaster—high ground and sandy soils—a sandy loam—poor sandy river land. It does better on hilly than level land, perhaps because it is dry and lighter. Its effects are good on every kind of dry gravelly swells and on soils that are stony and thin. On land inclined to be wet, on a cold clay, and on a flat white clay, the Plaster does not succeed. The soil called a loam, not over stiff, is most favorable to the Plaster.

Query 2. What quantity per acre has generally been used?

Ans. It is difficult to fix the requisite quantity.

As much effect has been produced from a half to two bushels to the acre, as from four to six, when season and other favorable circumstances combined. It however may be presumed, that the quantity of Plaster may be regulated by the quantity of vegetable matter or the fermentable putrifying substances

it finds in the earth on which to operate. If these be scarce, a great quantity of Plaster beyond what is necessary to operate with them, is hurtful. However, from one to four bushels to the acre have frequently been used, but the general opinion seems to be, that its application in small quantities, even as low as half a bushel to the acre, and frequent repetitions are the best.

Query 3. To what kind of Grasses is it best applied? and when is the best time to scatter it? and what the effect?

Ans. It is generally used most profitably for white and red Clover; though it will improve any kind of grass. Grass lands on which the Plaster has been spread stand the drought much better than unplastered—and cattle love to pasture on them better.—The best time to scatter it is in the spring when vegetation is fairly abroad. On Clover, it is sown from February to May, and improves red clover vastly, even so late as the latter month. It has also been applied in June after mowing the first crop, with good effect. As clover seed is generally sown in the wheat in the spring or put in with barley or oats the best time to apply the Plaster is, as soon as the grain crop is off, as it gives a good growth to the clover before the winter sets in, which is apt to injure it if small. The effect of Plaster on red clover is greater than on any other crop whatever.—Three tons of clover hay to the acre have been made on land really poor, by giving the clover top dressings of Plaster; and on land in heart or manured, from four to six tons, and an average of two and a half tons per acre for several years.

Query 4. To what kind of grain crops can it be best applied, and at what times, and, in what way should it be applied to them?

4th. The immediate benefit of Plaster to Indian corn is vastly greater than to any other crop, clover excepted, whilst its benefit to the land is equally great. Unplastered spaces across large fields of corn have been frequently visible during the whole crop, producing not an equal, but a considerable difference in inferiority. Rolling Plaster bushel for bushel with Indian seed corn, has an admirable effect on the crop. The manner and time of applying it to benefit the corn crop are different, in different places—sowing it just in advance of the plough, when fallowing for corn, on land well covered with vegetable matter—sowing it broadcast among the Indian corn after it is up—strewing it on the plant and hill when the corn receives its first dressing—and rolling it with seed; strewing a table spoonful on each plant or hill when the corn receives its first weeding—and rolling it with the seed (it being made very wet) bushel for bushel, are all practised with great success. The effect of the Plaster on small grain crops is not very great; on spring or summer grain, such as barley and oats, it has however the best effect by rolling it with the seed when sown.—Although the wheat crop is less benefited immediately than any other, yet the rolling of the wheat bushel to bushel with the Plaster facilitates the vegetation of the clover sown on the surface in the spring, and strengthens it against summer drought, so frequently fatal to it in coarse soils; and by thus improving the fertility of the land, considerably augments succeeding crops.

Query. 5. Has the application of it been repeated with or without ploughing? With other manure, and what? and the effect, if any, superior to the Plaster alone?

Ans. Except when sown on clover, the Plaster has been found to succeed best when covered or worked into the earth. It is the general opinion that the Plaster should have something to feed or operate on. A cover of vegetable litter produced by inclosing, or a clover lay well turned in, the plaster having been previously sown thereon, or any animal or vegetable putrifying substances in the earth, afford it a fit pabulum to operate on. The Plaister operates more powerfully when in connection with vegetable or animal substances, and increases the effects of coarse manure considerably; hence one of the best modes of using it, is sowing it on and ploughing it in with coarse litter. By applying manure with, preceding, or after the Plaster, the land will in less time be much more productive. When ploughed into the earth, its effect is not so likely to be destroyed by excessive moisture or drought, as when sprinkled on the surface.

Query 6. In consequence of its repeated application to the soil, is it found that it renders the earth sterile, after its useful effects are gone?

Ans. There is no greater degree of sterility after plaster, than after dung. All manures are stimulants and leave the earth wearied and vapid, from the exertions they have excited. Lime and Plaster repeatedly applied to land kept in constant culture, without the intervention of vegetable matter, will finally render it barren. But by applying putrifying substances, either animal or vegetable, for the Plaster to operate on, long and actual experience has testified, that the plaster may be repeated as safely, and with more benefit and less expence, than any other manure, on soils suitable for its application; nor is there any doubts whatever on the subject of its constantly ameliorating, instead of exhausting the soil.

Query 7. Does it operate immediately on its being applied to the soil? And what is its durability?

Ans. The Plaster when applied to some soils does not operate for several years, and then shews itself in a luxuriant vegetation of red or white clover, or some other grass. As to its durability upon the soil, it benefits land or crops longer than dung without restriction of quantity. Its permanency however, is not always uniform, owing, perhaps, either to the nature of the soil, the difference in seasons, or the goodness of the Plaster. When it throws up gentle and moderate crops, its efficacy is of the longest duration. If it is violent in its first operation it is of short continuance. It has sometimes exhausted itself in one year; from a dressing of three or four bushels, it has benefited land for 5 or 6 years. Perhaps the scattering it annually, or every other year, in small portions, will continue for a length of time gentle operations and prevent violent efforts.—Where it has been sown in this way, good crops of grass have been obtained for 12 years and upwards.

RED CLOVER.

No. XXVI.

Red Clover is too valuable to need an eulogium. In every good system of agriculture, particularly in a system of improvement, Clover is absolutely necessary, as forming the basis of the whole, as without which, no valuable plan of cultivation can be pursued. The many thousands of acres of worn or exhausted land in the different parts of North Carolina, testify to the total and shameful neglect in the people of cultivating this valuable grass. Clover, aided by inclosing, together with gypsum and deep ploughing, is able to convert sterility into fruitfulness, and scanty crops into those the most abundant. In every part of the United States where the soil is in a high state of improvement, Clover is extensively cultivated, and is acknowledged to be the principal agent in effecting these improvements. I am persuaded that those who have lands susceptible of improvement, could not lay out their money to so good an interest as in the purchase of Clover seed; as their money would soon be reimbursed treble or quadruple fold in the rapid improvements which would be effected on their farms by means of the Clover.—Clover when well put in on a good soil, and having a top dressing of plaster of two bushels to the acre, will afford the first year three tons of good hay to the acre, the second year it may be cut once and afterwards pastured to the middle of October, the third year it will afford excellent pasture to hogs, sheep and milch cows during the summer, and in September may be turned under. It is the best pasture for raising healthy stock of every kind. Cattle, &c.

grazing on it will be fatter throughout the whole season, than on any other pasture. The butter and cheese made from the milch cows, will be of a superior flavour and appearance, and will keep pure longer, than that made from any other grass or herbage. From its luxuriant and quick growth, it defends the earth from the scorching rays of the sun, and if not fed too late in the fall, will keep the earth warm in the winter; and in a measure defend it from the violence of the frosts. Clover cut green and permitted to lie six hours in the sun, and then given to horses, will prevent their having the slabbers. But it is when properly cured, the best hay for any kind of stock: and may be raised on the highest hills on a farm where there are no bottoms suitable to raise timothy: and the raising of it for hay is greatly to be preferred to any timothy meadow. When Clover seed is sown for the purpose of improving land speedily, it should be inclosed and the Clover neither cut or grazed, in order that it may extract from the atmosphere the greatest quantity of vegetable matter possible, to be given to the earth when elaborated into a form sufficiently permanent to benefit it.

But when clover is intended to be mowed, one gallon or from eight to twelve pounds of seed to the acre should be sowed in February or March; and by giving a top dressing of plaster to the Clover as soon as the grain crop is off it will be sufficiently large to mow on almost any kind of soil, the year following. The following method of curing clover hay, is simple, cheap, and quickly performed.

Save a parcel of straw to mix with the Clover in the following manner. Let the clover the first day it is cut, lay in the swarth: as soon as the dew is off the next day, turn it: in the evening, haul it to the mow, barrack or stack, where it is intended to be

deposited: then at the bottom put down a layer of the straw six inches thick; then another layer of clover twelve inches thick, and so on with straw and clover alternately, until it is all finished. I have never seen any moulded or mow burnt when put away in this manner.

Horses and cattle are fonder of the straw (when imbibed with the juices of the Clover) in the winter, than of the best timothy hay that can be offered them, especially if a little brine is sprinkled over the straw at the time of stowing it away; by managing it in this way, the color and smell of the Clover in winter will be equal to any hay: and horses have been known to leave the green grass in midsummer and eat the hay thus prepared, in preference. Clover should be cut for hay when the blossoms are turning of a brown hue and are beginning to seed.

Considering Clover as necessary to the best plan of conducting a farm, it is the duty of every real friend to this necessary science, to promote the cultivation of it. A great obstacle to the propagation of this valuable grass, arises from the high price of the seed, owing to the trouble of gathering and the difficulty of cleansing it. Could this difficulty be obviated, Clover seed might be sold at a much less price than is now demanded for it. The following plans of gathering and cleaning the seed, are practised in the states of Pennsylvania and New York, where they have long been in the habit of raising seed for sale. When clover is kept for seed, it must stand till the heads are very brown, or until one half of the field has changed its color by the dryness of the Clover heads; you then begin to collect them, which is done by a machine invented at Brookhaven, in Suffolk county, New York. It is drawn by a horse and guided by a man or boy, who will collect from the field by this means, the heads of clover

growing on five acres in one day. This machine is of simple construction; it is nothing more than an open box of about four feet square at the bottom, and about two feet high on three sides, one part, which we may call the fore part, is open; on this part is fixed fingers similar to the fingers of a cradle, about three feet long, and so near together as to break off the heads from the clover stocks, which are taken between those fingers: the heads are thrown back into the box as the horse works on.—The box is fixed on an axletree, supported by two small wheels of about two feet diameter; two handles are fixed to the box behind, by which the man or boy, at the same time he guides the horse, lowers or raises the fingers of the machine so as to take off all the heads from the clover: as often as the box gets full of heads, they are thrown out, and the horse goes on again. All the heads of Clover, in what manner soever collected, ought to be put into small heaps or cocks, of the quantity of about the bigness of a large corn basket, in the field, and there exposed, that the husk may rot (which effect will take place according to the state of the weather as respects heat and moisture) otherwise it will be very difficult to get out the seed. Some attention ought to be paid to these heaps or cocks, lest they should rot too much next the ground: it will sometimes be necessary, in case of much rain, to turn the heaps; by rubbing the heads in your hand it may easily be perceived when the husk is sufficiently rotten.

Whenever it is found that the heaps are sufficiently rotted and dry, they are carted into the barn, and whenever it is found convenient, the seed is threshed out on the barn floor, and cleaned with a wire riddle. The other plan is, after the hay is threshed the heads of the clover are put into a hogshead, or

which is added a sufficient quantity of water to moisten the whole, in order to induce a fermentation.—The farmer should carefully attend to this critical operation, and suffer the fermentation to proceed only as far as to affect the capsules or chaff, without injuring the seed. After this operation, the clover heads are spread on a barn floor to dry, when a slight threshing easily extricates the seed.

Clover seed is sown in different quantities, according to the richness of the soil, and the use that is intended to be made of the Clover.

If seed is to be collected from the first crop, the clover seed, from four to six pounds to the acre, is generally sown with the wheat on lands able to produce from eight to twelve bushels by the acre. The Clover on such lands will not be too thick to produce seed from the first crop, but standing tolerably thin on the ground, the heads will be well filled with seed. If your land be rich and you mean to mow the first crop, and collect seed from the second, from twelve to sixteen pounds is not too much to put to an acre. Sixteen pounds or more on winter grain has been thought by many farmers not to be too much per acre, and a less quantity on spring grain. A top dressing is of great benefit to clover, if sown over it early in the spring; on stiff soils, ashes or soot is the best; on light lands the Plaster of Paris. If any of these are sown over it ever so thin, it will nearly double the crop.

WHEAT

No. XXVII.

Wheat, the most valuable of all vegetables, was brought into America by the first settlers, and has been cultivated with success, from the first settlement of the country. For a long time, it has been the staple of the middle states and bids fair to become that of the southern states, particularly of N. Carolina, as soon as the navigation of our rivers is effected. The states of Maryland and Virginia, have, long since, exchanged part of their tobacco lands, for wheat: and in North Carolina, we may likewise look for its substitution for tobacco, as soon as those obstacles which have hitherto prevented its cultivation for market, shall be removed.

Wheat and flour have always constituted a large proportion of the exports of the country—In several years since 1783, the amount of these exports has averaged annually from six to fourteen million of dollars—The West Indies, Spain, Portugal and G. Britain have been the principal consumers of these articles. The West India Islands have always furnished a market for a large proportion of them, and in times of scarcity in Great Britain, and in the southern parts of Europe, the United States have come in competition with the grain countries of the north of Europe. As the soil and climate of almost every part of North Carolina is well adapted to the cultivation of wheat, it will no doubt become one of our most important staple crops, as soon as the naviga-

tion of our rivers affords it an easy and cheap transportation to market.

Under these impressions, I have thought, that it would not be unacceptable to the farmers of this state, to detail the best modes of cultivating wheat, and the means to be used to prevent or escape those calamities to which it is exposed.

As the wheat crop generally receives no more cultivation after it is committed to the earth, the soil intended for its reception, should be brought into a fine condition; to effect this, manuring and deep culture are indispensable. When these have been judiciously applied to the soil, it will be in a loose, mellow and fertile state, and possessing such a depth of tilth as will have a tendency to preserve it in this state.

All farmers who have made the experiment, will agree, that one acre well manured and prepared, will produce more wheat than two or three acres which have received little or no manure or have been badly prepared. This should teach us to cultivate less land, prepare it better, and thereby make more abundant crops, than to cultivate a larger quantity more imperfectly and make less.

The most important rules to be attended to in the cultivation of wheat may be summed up under three heads viz manuring, deep ploughing and shallow seeding.

To insure a good crop of wheat, in fact, the foundation of its success must depend on deep ploughing, and I might with strict propriety extend this remark to every other grain crop in cultivation among us. The roots of wheat will penetrate four feet of tilth and those of corn will strike still deeper, a fact which in removing every objection against deep plowing, should at the same time convince us of its great utility.

The great difference between the average produce of wheat crops in this country and in England, ought to dissipate our delusions with respect to its present mode of culture, and to awaken our enquiries after better. In England they plough vastly deeper than we do, and to this circumstance, in part, I am disposed to attribute the great superiority of their wheat crops in point of product over ours. But however deep our ploughing may be, shallow seed sowing—The coronal roots of the wheat are formed near the surface, and the plume and radicles perish, in whatever depth the seed be deposited. Clover leys and fallow crops are both deservedly valued in preparing the ground for wheat, and both have their respective advocates. Wheat can certainly be put in in the neatest manner upon grass leys, and the practice of sowing it in this way, particularly on a clover ley with an plough'g, is much adopted both in England and the most improved districts of the United States, being attended with complete success in raising good crops and also improving the land. When this mode is adopted, the sod, whether of clover, trefoil or herds grass, should be turned under deep with a good plough and strong team; so deep as completely to prevent their growing to the injury of the crop. The sod may be turned under in August or September and between that and the time of sowing the surface should be well harrowed, to pulverize it, for the reception of the seed and at the time of sowing the seed should be harrowed in. A great advantage derived from harrowing in grain, is, that after your field is prepared for seeding, you can rapidly sow and harrow in your seed; and have the choice of weather and other circumstances: which the more tedious process of ploughing in your seed would not permit. Strange as it may appear to some, yet it has

been found by experience to be a decided advantage to graze those fields which are proposed to be fallowed in any given year for wheat; because by this means the farmer is enabled to have the ploughing executed more effectually and to prepare good seed bed for the wheat. There are certain crops (which are termed fallow crops) which are well calculated to prepare the ground for wheat; as the cultivation which they require necessarily brings the soil into a fine, open and mellow condition for the reception of the wheat. Tobacco is an excellent crop for this purpose; beans, peas and potatoes also answer well; but as wheat generally follows Indian corn in this climate, I shall confine my remarks to this crop.—Since Taylor's plan of cultivating Indian corn in ridges has been generally adopted, some difficulty has been experienced in seeding these ridges in small grain. Small patches of corn may be gathered and the stalks removed off in time to sow wheat; but in a large crop this is impracticable; because the labor cannot be performed in time by the hands on the farm, and in leaving the corn out to dry after being taken off much loss is sustained. A great part of the wheat crop will consequently have to be sown among the standing corn. To do this well depends upon ploughing in the wheat properly—To make the earth meet in the line of the corn—to plough deep and cover the wheat shallow—and to leave deep and wide water furrows, are the objects to be attended to; the hoes should follow the ploughs only for the purpose of chopping the few spots in the line of the corn remaining uncovered, and hanging to the stalks the ears that may be broken off. The best instrument for ploughing in wheat in this manner is the trowel hoe plough with one mould board next to the corn—the bottom of the mould board should be

raised three inches above the eye of the trowel hoe, for the purpose of ploughing the ground deep and covering the wheat shallow.

Wheat sown on high ridges will have a tendency to roll down into the water furrows where there is the least soil: to remedy this a trowel hoe with double mould board (one on each side) should be run in each water furrow to throw out the wheat and make them deep and wide. Where the ground is dry and free of grass, the wheat may be very well put in with a five tooth coulter harrow, to be followed by a straight tooth drag or harrow.

In wet low grounds, which should be thrown into seven feet beds, a single horse fore share or dagon ploughing in the wheat up to the corn with a light furrow, and followed by a straight tooth drag or harrow and the water furrows afterwards opened deep and wide, is the best mode.

WHEAT.

Continued.

No. XXVIII.

Having in a former number stated the best modes of cultivating Wheat, I now proceed, as proposed, to detail the means to be used to escape or prevent those calamities to which it is subject.

These are rust or mildew, smut, the Hessian fly and weavil.

The rust or mildew, proceeds from repletion or from the extravasation* of the juice of the plants, dried by the sun on the stalks.

This extravasation is caused by a sudden obstruction of the juice of the plants, owing to a very cool night, preceded by several days and nights of very warm weather. By a continued heat, the earth is warmed to a great degree, and all nature invigorated—this occasions a great ascent of the juices, so that every vessel is full (as in an animal of a full or plethoric habit, when all know there is the most danger of the vessels bursting) a sudden cold ensuing at this critical season chills the tender stalk, particularly in its slenderest parts, and there brings on a stagnation. But the earth being deeply warmed by the long and intense heat, not cooling so soon as the stalk, continues the violent ascent of the juices as before; and if there be any obstruction or stoppage above and in the slenderest part of the stalk, what must, what can be the consequence of this but an extravasation or that the vessels burst?

* By extravasation is meant, the act of the juice flowing or being forced out of its proper vessels.

It has been ascertained, by long experience and observation, that mildews or rust always come in cool nights after intense and continued heat. Such a cold, succeeding heat, every one knows will occasion a great dew. And this is no doubt the reason why this rust has been ascribed to the dew, and called meldew or mildew.

Another fact which confirms this hypothesis is this: that the thin leaves and slenderest parts of the stalk are first affected, hence the spots first appear on the stalk just below the ear: here the stalk being the smallest, and the vessels narrowest, is the first stopped by the chill, as might be expected—And accordingly just below this, the first eruption appears; and so lower and lower, till without relief it covers the whole, and entirely ruins the grain if not already filled.

It is another well known fact, that ground in new settlements, or wheat growing on new or fresh land, is much less exposed to mildews, than old fields or plantations that have been often dunged. The reason of this is plain upon this hypothesis; for dung heaps are known to receive and retain a much greater degree of heat than common earth. Hence, if large quantities of dung, particularly in a *fresh* state, be applied to land for a wheat crop to be grown immediately thereon, owing to its heating nature, it will in all probability occasion the crop to be mildewed. Because it must occasion, according to the hypothesis, a more violent ascent of the juices, and so the stalk will be proportionably in more danger of bursting, and of an extravasation of the juices, upon a sudden chill in the stalk.

Another fact commonly observed is, that higher grounds are not so exposed to mildews as lower.—The reasons are plain upon this hypothesis—1st. Because there is not so much difference between the

weather in day and night on high grounds, as in the lower. 2d. Because the greater motion of the air in high land, may in some measure prevent the stagnation of the juices—Upon this principle too, an high wind may prevent the mildew, and accordingly they are never known to come in a windy night, though cold. The wind by keeping the stalks continually in motion, prevents a stagnation of the juices; in like manner, the blood never becomes stagnant in any part of the body when it is kept constantly in motion. It is upon this principle, that we can account for the reason, why it is recommended in England, to keep a stretched rope constantly moving over the fields of wheat, when the state of the weather is such as to excite an apprehension of their being exposed to mildew.

Or, if rust or mildew is produced by a combination of heat, moisture, shallow ploughing, and a flat surface, still the remedy is the same under either supposition.

This remedy consists in deep ploughing, high ridging, and deep wide water furrows, which will constitute a mode of culture the reverse of that which has generally afflicted wheat with the rust or mildew.

The high narrow ridges dissipate or scatter the intense heat of the sun, which a flat surface would increase; and the deep wide water furrows serve to drain the ridges of their superfluous moisture, (so as completely to prevent a stagnation of the water about the roots of the plants, so fatal to them) and as flues for the transmission of air through the wheat, the ridges and furrows therefore answer the valuable purpose of diminishing heat and moisture, which appear to be the chief causes of the disease and w-

The injurious effects of fresh dung may also be avoided by applying it to Indian corn as a fallow crop for wheat; by the time the corn crop finishes its growth, the manure will be in a sufficiently putrescent and mild state to benefit the wheat to be sown on the ground, to which it has been applied.

Cultivating those kinds of wheat which ripen early, is also recommended, as a precaution to escape rust or mildews; the necessity of attending to this is confirmed by what has occurred in the United States. The farmers in the fertile, but moist peninsula between the Delaware and Schuylkill, had suffered many years so severely by mildew, from continuing to sow the old wheats which ripened late in July and August, that many of them ceased to cultivate wheat. At length the introduction of the "Isbell" or early wheat from Caroline county, Virginia, which ripened the latter end of June or beginning of July, enabled them to resume the cultivation of that species of grain.

Should the means recommended to avoid mildew be neglected, and should it make its appearance in the crop, to prevent its further extension, the grain should be immediately cut. It should then lie on the stubble until the straw be firm and crisp enough to be set up in sheaves; permitting it to remain in the field, until the grain shall have received the nutriment which the stalk may be able to impart.

Wheat crops in England have frequently been cut in their milky state, yet the grain has been found to mature, and always to afford a fine skinned beautiful sample. This fact has been asserted by American and British agriculturalists, and further stated by them, that by such early reaping of grain, on the first appearance of mildew, you may obtain a valuable, though not an abundant crop; the sap in the stalks continuing its natural course to the heads

whereas if the same grain remained uncut, the seeds would be shrivelled, and often give chaff only instead of flour.

How is this to be accounted for? Upon the same principles upon which the cause of mildew is accounted for.

The stalks of grain being severed from their roots, the source of the malady is cut off. The vessels of the stalks are no longer distended by a superabundance of sap ascending from the heated soil—they cease to receive any—The bursted vessels through the wide breaches in which the sap, in its rapid ascent was rushing, naturally close; and the sap already received into the stalks (further aided perhaps by dews) pursues its gentle course to the heads, and fills the grain.

Rav grass that is cut even while in blossom, is well known to mature its seeds with the sap that is lodged in the stem.

It may also be remarked, in confirmation of this opinion, that the ears of Indian corn, will harden and dry, although the stalks be cut off three weeks before the ears are ripe, provided the stalks be set up in shocks in the field, or along the fences. Hence there is nothing to fear from cutting wheat or other corn, before the straw be ripe; and it may also be added, that grain which is cut while underripe, is less liable to be injured in the field by moist weather, than that which has stood until it be fully overripe.

WHEAT.

Continued.

No. XXIX.

The smut of grain is easily distinguished by the black dust which covers the ear, seemingly as if sprinkled with soot; whereas the mildew or rust infests the stem and leaves with yellow and dark brown spots, or with a dust of an orange colour. On examining the smutty ears of wheat, some grains will be found sound, while others have been reduced to chaff and others small and shrivelled. By washing the infected grain with water in a round vessel adapted to the purpose, to which is given a rapid circular motion, they may be wholly divested of the smut (however, when the smut is so glutinous as not to be thus washed off, an equal quantity of fine sand should be mixed with the water, to cleanse it more effectually) and much useful grain preserved, which when dried and sown, an experienced farmer has asserted, produced a moderate crop and perfectly free from smut. The smut is seldom seen among bearded grain, as rye or barley, it being mostly predominant in wheat, especially in the smooth eared sort and generally in a late harvest. Like the mildew, it is most prevalent in low grounds and in a damp or foggy season; but never produces such extensive damages as the mildew which infests whole fields of grain and grass. The time of blooming is the critical period at which the smut begins to shew itself and then proceeds rapidly, converting part of the ear into chaff or preventing the grain coming to maturity.—Means of prevention

Make choice of the best seed wheat. This is to be done at harvest by selecting that part of the crop which ripened earliest, which contained the largest and best filled heads and the soundest and plumpest grain; it is only in this way that any preferred species of wheat, can be preserved or improved. A change of seed is also recommended as an effectual means of preventing the smut and other diseases to which wheat is liable. In the Netherlands, perhaps one of the greatest wheat countries in Europe, changing the seed is regularly and systematically attended to. In England also, changing the seed of all their culmiferous grains once in every three or four years is considered as highly beneficial. It is here to be observed that wheat and all other culmiferous grains were originally much inferior to what they are at present; that they were first obtained in their wild state whilst defective in regard to quality and produce, and that by cultivation and farther selection, they have been improved to their present standard of perfection.

If, therefore, they are negligently cultivated, they would all again degenerate, and return to their originally wild state; and that they have a tendency to degenerate, and are liable to become diseased, *if without selection*, they are always cultivated on the same soil, is evident, from the experience of thousands.—Convinced by experience of the justness of these remarks, attentive farmers frequently change their seed by procuring a new stock every three or four years from a different neighborhood, county or district.—By such changes, when properly made, they increase the quantity of their produce, they improve the quality of their grain; it becomes less liable to disease, and their crop is earlier ripened, if brought from earlier districts. If farmers even in the same neighborhood, were to get in the habit of changing seed

wheat with each other every three or four years, instead of cultivating the same continually on their farms, they would find an advantage in it.

As the smut has been considered by many writers as very infectious, and that infected seed will uniformly and almost inevitably produce an infected or smutty crop, various steeps have been recommended for the prevention of this disease. By steeping seed wheat, we have an opportunity of scumming off all light or shrivelled grains which float on the surface, and of preserving for seed all the sound and heavy grains which invariably sink to the bottom of the liquid in which they are steeped.

Tull, the father of the drill husbandry, relates that a ship load of wheat was sunk near Bristol, in autumn, and afterwards at ebbs, all taken up; but being unfit for the miller, it was used for seed. At the following harvest, all the wheat in England was smutty, except the produce of this *brined* seed. Mr. Richard P. Barton, of Frederick county, Va. relates that in 1805, some wheat was brought from Pennsylvania, to exchange for salt; and having purchased two bushels, he steeped it in a strong salt brine and then sifted on it as much quick lime as would adhere to it. Two of his neighbors sowed some of the same wheat without steeping. The soil was the same, and the seeding done in good order, and in good time. Mr. Barton's crop was free from smut, at the following harvest, but the crops of the other two persons were much infected.

Mr. Jeb Roberts, author of the Pennsylvania farmer, has also proved the utility of steeping the seed in simple salt and water. For the sake of experiment, he sowed a strip in the middle of the field with dry unsteeped seed, and the backwardness and

want of vigor in the wheat in this strip, compared with the rest of the field, was so apparent as to be distinctly visible. He further observes, that several of his neighbors had tried the same steep, and were so convinced of its utility, as to induce them to continue the practice. When seed wheat is rolled in plaster of Paris, it should previously be soaked in strong brine, or the plaster mixed with the brine.—By this means, it retains moisture much longer than when mixed with water, and the wheat comes up quicker and better, particularly in a dry season, which is a great advantage. In the Netherlands, one of the great wheat countries of Europe, changing the seed and steeping in the following preparation, has never been known to fail. Dissolve three ounces and two drachms of copperas or blue vitriol in three gallons and three quarts (wine measure) of cold water, for every three bushels of grain.

As to the Hessian fly, which has committed such extensive ravages among the wheat crops in this country, a knowledge of the means to be used to prevent or escape its ravages, would no doubt be highly acceptable to the agricultural community. I will endeavor to give this information as far as I am enabled. The Hessian fly commits its ravages by depositing an egg or maggot on the wheat, which is always to be found between the lowest part of the leaf of the wheat, and the part which forms the main stalk or straw, and to the latter of which, that is to say, the stalk, it closely adheres, and is generally within the outside leaf, so as to lie as near the root as possible. When thus adhering to the stalk of the wheat, it lives or derives its nourishment from that kind of wheat which is the young stand by the most delicate straw. The manner in which the maggot obtains the juice is by sucking it, for it does not appear to possess any faculty of corroding or

eating away the solid part of the straw; as it grows larger, its whole body inclents the straw and prevents the rise of the sap, and the grain either falls down, or perishes before it has grown to be of any considerable height.

I am confident in saying, that when the soil is rich or in good heart, when it has been well prepared, and sown tolerably late in the fall with bearded wheat, there is little or no cause to apprehend the ravages of the fly.

The reasons in support of this assertion, are the following.

The fly generally attacks the wheat which is early sown; a greater quantity of them appearing about the last of August and first of September than at any other period in the fall: hence the necessity of sowing late, to escape their ravages in the fall — They no doubt lodge and deposit as many of their eggs or skippers in the luxuriant growth as they do in that of a slow growth, or dwarfy wheat; but that on a rich fertile soil, and well put in, if the shoot is injured in the fall by the egg being deposited in it, it will send forth fresh shoots from the main root, and thereby live during the fall and winter; and if deposited in the spring of the year, in wheat of a luxuriant growth, it will grow so fast as to be able to discard the egg or skipper from between the blade and stalk; or be able to afford a redundancy of juice, for the production of the fly, over and above what is necessary to keep up its growth.

Whilst on the other hand, wheat that is sown on poor or sterile land and badly put in, is always backward and easily penetrated by the fly; and, instead of growing, declines away, whilst the fly is sucking the sap out of the stalk, and for want of proper nourishment from the soil, is unable to throw out any new shoots in lieu of the one injured by the fly.—

From these remarks, we discover the necessity of having wheat land in good heart and well prepared, in order to escape the ravages of the fly. The Arator, which is a valuable authority on all agricultural subjects, has the following excellent and appropriate remarks with respect to the Hessian fly:

"The Hessian fly is so little understood, as to have become an excuse for the loss of crops proceeding from bad tillage. Lands are tired by *shallow* and incessant culture, or by being prevented from invigorating themselves with vegetable substances. Even the richest bottom lands are subject to weariness, and sometimes are said to have grown lousy, so that they will cease at length to yield good corn; and the crop has the appearance of being infected by insects. To such causes are owing most of the charges brought against the Hessian fly. They would be removed by manuring the land with good clover lays, and by deep ploughing, in the cultivation of the maize or of any other fallow crop, or by managing naked fallows in the same way. At least, my experience has never furnished me with a single instance, in which a crop of wheat has suffered by any insect, when the land was in heart and well covered with dry vegetable matter, when that matter was turned under as deep as four horses in a plough could do it, when the land had received a second good ploughing by two horses in a plough, and when the wheat was seeded on high and narrow ridges, with a clean furrow."

Bearded wheat is not so liable to be attacked by the fly as the smooth-eared sort, from the following circumstances: it branches more than any of the smooth sort, in this respect approximating to the progress of rye in its growth; it has a much smaller blade, more compact fibre, a small hard stalk, with very little hollow, which renders it harder at

penetration, and the smallness of the blade does not defend them as well as a large one: and lastly, the smallness of the hollow prevents them from burying themselves as easily as in a large hollow. As to the weavil, they are certainly avoided, by getting the wheat out early, throwing it up in the chaff, or cleaning it and depositing it in dry airy places under shelter.

TURNIPS.

No. XXX.

As the cultivation of Turnips upon an extensive scale, as well for the feeding of cattle during the winter months, as for culinary purposes, may and ought to become an interesting object to the citizens of the United States, the following observations are offered, as comprehending its most improved modes of culture:

The Turnip delights in a light, sandy loam; if a little moist the better, especially in warm climates. Upon new or fresh ground they are always sweeter, than on an old or worn out soil. Though such is the kind of land best adapted to the raising of turnips, yet they are cultivated upon every sort of soil in use as arable land.

Much of the sandy soil now laying waste in various parts of the union, might, with the assistance of culture and a small portion of manure, be profitably employed in producing turnips; for such ground, it

dressed with a light coat of clay or loam, would yield excellent crops of this vegetable.

The ground intended for the production of turnips in the ensuing season, ought to be deeply ploughed in October or November, and to be left in that rough state to receive the benefits of the winter frost, &c. In the April following, when it is perfectly dry, harrow it and let it lie so till the middle of May, when it should have another deep ploughing across, or contrarywise to the former; the first week in June harrow it, and towards the end of that month give the field a light coat of well rotted manure, and immediately plough it in lightly; after which the soil and manure are to be well incorporated, by harrowing the ground effectually with a weighty harrow.

Ah! says the farmer, this will never do; the crop will not be worth the expence. First make one fair experiment, and I am convinced you will not give up the pursuit: you ought to take into consideration, that after the turnips are off the ground it will be in a high state of preparation for several successive crops, of various kinds, and that without this, or similar tillage, it may remain during your life in an unproductive state.

The time of sowing depends much on the application; however, the general mode in the middle States, is to begin about the 20th July, and to continue sowing, as convenient from this time to the middle of August, or a few days after.

The quantity of seed sown on an acre by the great turnip farmers, is never less than one pound, more frequently a pound and a half, and by some two — If every grain was to come to perfection a quarter of a pound would be more than sufficient, but having to encounter so many accidents a pound is the least quantity that ought to be sown on an acre.

The period in which you intend to sow, being arrived, plough your prepared turnip ground once more lightly; give it one or two strokes of the harrow all over, and sow the seed *immediately* on the fresh surface. The method of sowing is generally, by broad cast, with a high and even hand; but some sow in rows by means of a machine called a turnip drill, which method is greatly approved of, particularly as by it much labor is saved in hoeing and thinning the plants.

In the former method, the seed is covered by drawing a light harrow backward, that is, wrong end foremost, to prevent the teeth which are generally set somewhat pointed forward, from tearing up the clods, and burying the seed too deep.

One of the most important parts of the treatment due to the cultivation of the turnip yet remains to be done, that is, to roll the field with a heavy roller immediately after harrowing in the seed, provided that the ground is sufficiently dry, or as soon after as it is in a fit condition. By this means all the clods are broken and much of the seed that would otherwise be exposed to birds, &c. will be covered, the surface rendered smooth and compact thereby, and consequently more retentive of moisture, which will greatly promote the vegetation of the seed and growth of the plants.

But the all important point is, that the rolling of the ground is experimentally found to be the most effectual method hitherto discovered for the preservation of the rising crop from the destructive depredations of the fly. The turnip fly is always found most numerous in rough worked ground, as there they can retreat and take shelter under the clods, or lumps of earth from such changes of the weather as are disagreeable to them, or from the attacks of small birds and other animals.

Experiments have been tried, on coating the seed with sulphur, soot, &c. and of steeping it in train oil, and in solutions of various kinds, as a security against the fly, but the result has not been such as to establish any practice of this nature.

Hoeing the plants and setting them out, as it is called, comes next under consideration; the method of doing this dextrously, is difficult to describe, nothing but practice can teach it. It matters not which way the operation is performed, provided the ground be stirred, the weeds eradicated, and the plants set out singly and at proper distances. The due distance is from seven to twelve inches every way: this must be regulated according to the strength of the land, the time of sowing, and the kind of turnip cultivated—strong ground and early sowings always producing the largest roots.

The critical time of the first hoeing is when the plants lie spread upon the ground are nearly of the size of the palm of the hand; if however, seed weeds be numerous and luxuriant, they ought to be checked before the turnip plants arrive at that size, lest by being drawn up tall and slender they should acquire a weak sickly habit.

This first hoeing is indispensably necessary, and a second might be given with advantage when the leaves are grown to the height of eight or nine inches, in order to destroy weeds, loosen the earth, and finally to regulate the plants.

Here again, will the farmer exclaim against the expence and trouble of hoeing; but let him try one acre in this way, and leave another of the same quality to nature, as is too frequently done, and he will find the extra produce of the hoed acre will more than six times compensate for the labor bestowed.

Raising turnip seed requires more attention than has hitherto been paid it. In Norfolk, the great

turnip district of England, the farmers there are masters in the art of raising turnip seed. It is a fact well understood by them, that if the seed be gathered *repeatedly* from untransplanted roots, the turnips from this seed will become 'coarse necked' and 'foul footed' and the flesh of the root itself rigid and unpalatable. On the contrary, if the seed be gathered *repeatedly* from transplanted roots, the necks will become too fine, and the fibres or roots too few; the entire plant acquiring a weak and delicate habit, and the produce, though sweet, will be small. The farmer has therefore two extremes to avoid. It has been found by long experience, that transplanting two, three or four years, and letting the plants run up in the patch, the third, fourth or fifth, will keep the stock in the desired state. The transplanted plants are to be put into a piece of rich earth in the kitchen garden, or in any other suitable place of the same kind.

ORCHARDS.

No XXXI.

The utility of an orchard, or orchards, both for private use and profit, stored with the various sorts of fruit trees, must be very great; as well as afford infinite pleasure from the delightful appearance it makes from early spring, till late in autumn; in spring the various trees in blossom are highly ornamental; in summer the pleasure is heightened, by observing the various fruits advancing to perfection; and as the season advances, the mature growth of the different sorts arriving to perfection in regular succession, from May until the end of October, must afford great delight as well as profit. The feelings of a lover of improvement can scarcely be expressed, on observing the almost universal inattention paid to the greater number of our orchards, and that people who go to a considerable expence in planting and establishing them, afterwards leave them to the rude hand of nature; as if the art and ingenuity of man availed nothing, or that they merited no further care: however, it is to be hoped, that the good example, and the consequent success of the careful and industrious, will stimulate others to pay the necessary attention to these departments, and thereby to serve themselves as well as the community at large.

As orchards in their general acceptation, comprehend a variety of fruit trees, it may perhaps be proper to remark, that the observations which will follow under this head will be exclusively confined to apple trees. There is no other fruit tree which so richly deserves the attention and cultivation of the husbandman as the apple; it will thrive and live in

almost every climate; it yields a fruit equalled by none in abundance and excellence, and a liquor, which if properly made, is little inferior to the best wine.

It behoves every philanthropist to encourage the cultivation of orchards and the making of good cider; by way of discouraging the too general use of ardent spirits. Good cider would be a national saving of wealth, by expelling foreign liquors; and of life, by expelling the use of ardent spirits.

The mismanagement of apple trees often begins in the nursery, by leaving suckers from the roots, by letting the trees grow so crooked as to become incapable of a good shape, and especially, by leaving branches for two or three years, which must be cut away when the tree is planted, because they are too low, or crowd the head.

This incumbrance has wasted a great part of the sap, which would otherwise have increased the regular growth.—The wounds occasioned by this lopping cannot soon be covered with new bark and in the meantime often produce a decay. Sometimes this neglect is continued in part, when the trees are removed from the nursery, because some persons regret the loss of branches which would bear the same or the next year, and others cannot foresee the bad consequences of keeping them, which will increase with their growth, and produce much worse amputation. The head of apple trees should begin at least six feet from the ground; and of those whose branches are [illegible] eight. When the head has been formed so low as five feet [illegible] may be [illegible]; but [illegible] ought to be trimmed near the stem, and [illegible] be enabled to rise. The head ought to [illegible] but one leader, because two [illegible], as the inward lateral boughs [illegible] each other. Its branches should

be equidistant, and not more than six, nor less than four. If the tree has ample root, and a strong body, the head may retain an upper tier, provided it is two feet above the first; but if not, it is best to leave only such upper branches, that have this height, and form the others from good buds. It is a bad practice to shorten the top or the branches, except a little where they are too slender for their length; by excess, it may be very difficult to produce a good leader; the branches will grow bushy, and be later in bearing, because the first fruit comes towards their ends.

Trees ought not to be kept too long in the nursery, because the small space allotted for them will not permit a regular expansion either of the root or the branches; besides, the removal, however careful, often kills them, or causes a lingering decay. An accurate inspection of the roots is necessary, for taking away any rotten parts, and worms, and also for cutting off those that cross each other, or are too close. None but long ramblers ought to be shortened, and they should be spread equidistant, so far as is practicable, which may be facilitated by wooden pegs. The too common fault of squeezing them into small holes, has ruined many trees: the holes must be wide enough to extend at least one foot beyond the limits of the longest roots, and the mould be made quite mellow.

The depth of the holes should not extend beyond the natural good soil; if you make a deep hole, bason like, into the clay bottom, or unfriendly sub-soil, which is too frequently done, and plant the roots therein even filling it round with good earth will not do, for as soon as it pushes its roots beyond this, they must enter into the bad and unfriendly soil, which will not fail to bring on the decay of the most healthy tree, and can never afford it suitable juices

for perfecting delicious fruit; besides, the lodgment of water about the roots in this confined bason, in wet seasons, will cause the tree to become sickly, and to get overrun with moss, and full of canker.

Young apple trees planted shallow and the holes filled up with rich native mould or earth, always succeed the best, or more completely insures the success of their living; for in shallow planting, the roots of the young trees are so near the surface as to feel the salutary influence of sun, air and rain.—A great orchardist once said—"always plant shallow and give a deep dressing."

A tree well pruned, planted, and secured by stakes against violent winds will soon acquire a habit of regular growth and will be easy to keep in good order afterwards.

ORCHARDS.

Continued.

No. XXXII.

Pruning is an important article in the management of orchards, and therefore deserves the particular attention of the husbandman. Pruning, when judiciously done, promotes the health of the trees, brings them sooner into a bearing state, and continues them in vigor for nearly double their common age.

Should it happen that any of your trees have large heads and but few and scanty roots, reduce their tops, by a select and judicious pruning, to a due proportion with their roots, for an ox, fed only thro' a wren's quill, could not long exist. This will seldom happen, unless by accident, or carelessness in the taking of them up; provided they are raised at proper distances in the nursery.

No branch should ever be shortened, unless for the figure of the tree, and then constantly taken off close at the separation, by which means the wound soon heals. The more the range of the branches shoots circularly, a little inclining upwards, the more equally will the sap be distributed, and the better will the tree bear, for from that circumstance, the sap is more evenly impelled to every part. Do not let the ranges of branches be too near each other, but let them be so disposed or situated around the stem, as will give to the inner parts ventilation, and admit sunshine, without much thinning.

A regular position of the branches will also by a balance of weight, keep the tree upright, and enable

the several parts to resist violent winds, and to support loads of fruit. Clusters of limbs on one side [illegible] incline the tree more and more, so as to be easily torn up by the roots, and also weaken the hold of the branches to the stem.

This last pruning of the inner parts will accumulate the fruit on the outward, and thus make the weight more powerful, as on a lever. The importance of good pruning is additional in this country, from the frequency of westerly winds, which give a contrary bias, and from the irregularity of the seasons, which in some years causes a great defect, and in others an excess of apples.

It has been before observed, that the principal pruning should be done while the trees are young and while the limbs (to be taken off) are small. The head of the tree should be formed while it is in the nursery, taking care to leave all the branches as nearly equidistant as possible.

When pruning is too long neglected, the limbs to be taken off become so large as to render this operation extremely prejudicial to the tree. Many persons are so stupid as to mangle regular and healthy trees, on the pretence of making them better by thinning, lopping off branches thicker than their own arms and legs, moreover, lacerating the parts, and leaving them exposed to all the injuries from heat, cold, wet and insects, and thus a certain prey to gangrene. Sawing the stumps will not avail, because they convey moisture and frosts to the stem, even before they rot. In a few years, large holes appear in the body of the tree, the remaining branches become sickly, and produce bad fruit, and a premature death is generally certain. How often have farmers nearly ruined their orchards, by hauling from them in the spring, waggon loads of the finest branches, full of bloom buds.

When by neglect, irregular branches have become large, as beyond a diameter of two and an half inches, it is unsafe to cut them off, but some of their smaller boughs may be removed. If they gall others, the amputation cannot be avoided, but healing plaster and good covering should be applied to the wounds.

Whenever a branch is cut off, it is essentially necessary, that it be taken off perfectly smooth and close, for it is impossible the bark can grow over a stump, because there is no power to draw it that way. In pruning, when doubts are entertained whether a certain branch should be taken off, consider whether it will be in the way three years hence; if it will, the sooner it is off, the better. When pruning is neglected, an orchard becomes of very little value, as boughs will then be suffered to hang dangling to the ground, and the heads of the trees will be so loaded with wood as to be almost impervious to the sun and air.

By a redundancy of wood, the roots are exhausted unprofitably, the bearing wood is robbed of part of its sustenance, and the natural life of the tree unnecessarily shortened; whilst the superfluous wood endangers the tree by giving the winds an additional power over it, and is injurious to the bearing wood, by retaining the damps, and preventing a due circulation of air. It is common to see fruit trees, by a neglect of pruning in due time, with two or three tiers of boughs pressing so hard upon one another, with their twigs so intimately interwoven, that a small bird can scarcely creep in among them. Trees, thus neglected, acquire, from want of due ventilation, a stinted habit, and the fruit becomes of a crude inferior quality.

If pruning is commenced in the nursery, and regularly continued every spring in the orchard, by tak-

ing off small limbs as they gradually appear, by this means keeping the trees in a bearing and flourishing state, all the advantages to be derived from this operation will be fully experienced, and its disadvantages, arising from neglect and its improper application, entirely avoided.

ORCHARDS.

Continued.

No. XXXIII.

With respect to situation, very thriving orchards are frequently found on high and low grounds, on declivities and plains, in various aspects and exposures; but this is in consequence of the natural soil being good. You should, however, avoid very damp situations, particularly such as lodge water, for in very wet soils, no fruit trees will prosper, nor will the fruit produced in such places be good; but a moderately low situation, free from wet, may be more eligible than an elevated ground, as being less exposed to tempestuous winds; but, if having a gentle declivity, the more desirable. A proper soil being the grand and essential requisite, should be carefully selected for on this depends much of your success; a good deep sandy loam, neither too dry, nor wet, is the most suitable for all kinds of fruit-trees, and when there is the choice high or low situations, it should be preferred to every other. Generally speaking, ground that will produce good crops of natural grass, or kitchen garden vegetables, is suitable for an or-

chard; if of a loamy nature, it will be a particular advantage, any soil, however, of a good quality, not too light and dry, nor too heavy, stubborn, or wet, and not less than one spade deep of good staple, will be proper for this purpose.

You should have great regard to the distance of planting the trees, which is what few people have rightly considered; for if you plant them too close, they will be liable to blights; the air being thereby pent in amongst them, will also cause the fruit to be ill-tasted; for a great quantity of damp vapors from the perspiration of the trees, and the exhalation from the earth mixed with it, will be imbibed by the fruit, and render their juices crude and unwholesome; besides, it is the opinion of some well informed naturalists and orchardists, that these vapors and perspiration of the trees, collect the heat of the sun, and reflect it in streams, so as to cause what is called a fire blast; which, is extremely hurtful to fruit, and most frequent, where orchards are open to the south sun.

An experienced orchardist observes, that "his apple trees are planted 33 feet apart in squares, which he considers the nearest distance, they should be planted." Another distinguished orchardist of Pennsylvania, "thinks that squares of forty feet is the proper distance."

In dry, sandy ground, plant trees in autumn, and in soils inclined to be moist or watery, in spring, otherwise the winter is apt to chill and kill them.—In such soils it is good to open the holes in the fall, and let them remain open all winter; this enriches and mellows the land thrown out, and fits it better for planting. Where a soil is light and sandy and not subject to inundation, plant the trees in the fall, and they will gain fibres enough to support them before winter, and will shoot well the next spring.

and better than those planted in the spring.—The time of planting young apple trees will be regulated by the season. In the fall they may be planted as soon as they have shed their leaves, provided there is no frost in the ground, and in the spring before the buds begin to burst.

In planting trees, should the earth be rather shallow, so that you cannot cover the roots a sufficient depth with good soil, you must have some hauled, for that purpose, to where each tree is to be planted, or collected to such places, from the general surface, and bank the roots around therewith; for there is no alternative, between planting them in the good soil, where their roots can take a wide extended horizontal direction, and lie within the reach of the genial influence of heat, rain, dew and air, and that of an untimely end, if planted too deep.

Tillage is favorable to the growth of young trees, whereas in grass ground their progress is comparatively slow, for want of the earth being stirred about their roots and kept loose and open.

William Coxe, of New-Jersey, who has paid more attention to the raising of orchards, than perhaps any other person in our country, (he having above 3000 apple trees in cultivation) thus remarks, 'young orchards thrive in proportion to the goodness of the soil and the degree of cultivation bestowed on them. Shallow planting more completely insures the success of their living: which preserves the roots so near the surface of the earth, that by keeping the soil around them in a loose and mellow state, free from weeds, grass or grass, they may feel the salutary influence of the sun, air and rain, the last of which, in our dry climate, is particularly essential to their success, for several years after planting. For this reason, all kinds of tillage crops, such as potatoes, vines, and Indian corn, particularly the last, are

peculiarly adapted to the first and second year's cultivation of orchards.—It is an excellent practice, if orchards are sowed in any kind of small grain or grass, to dig up the earth twice in the year around the root of the trees for several feet so as to make a circle of at least six feet diameter. All grain crops are injurious in proportion to their proximity to the tree, their power of exhausting the moisture, from their color or producing a great degree of intense reflected heat. To avoid these injurious effects, dig as mentioned above three feet around, which will keep the soil loose around them, and enable the trees to resist or live in a long drought. Although this operation where extended to several thousand trees, which at present compose my orchards, necessarily is productive of much expense and trouble, I am repaid fourfold in the increased vigor of my trees, and still more in their preservation from our summer drought.'

There is no doubt that continually enriching and cultivating old apple orchards is injurious to the trees—but for young trees it is attended with the greatest advantages. By manuring and cultivating old orchards too often, it causes them to overbear, and by forwarding the fruit too soon, to drop before the time for gathering to keep, or for cider. Mellow mud or rich mould, is the best manure which can be applied to young apple trees. If the ground is poor, stable manure is the least proper kind to be used, being, from its nature, least able to resist the destructive effects of our summer droughts, and affording a shelter to vermin equally pernicious in the winter, particularly in light soils; rich earth or river and meadow mud ameliorated by frost or putrefaction, either in its simple state, or mixed with ashes, lime or perfectly rotten dung, is of all others after the first year, the best dressing, to be spread on the

surface and ploughed in. It is an excellent practice to keep hogs in an orchard to eat all the fruit which falls while small and unripe, thereby to destroy a worm called curculio contained in the fruit, which are extremely injurious to fruit and fruit trees.

When hogs are kept in an orchard, they should be tied in mornings around the roots of each tree, until you get through the whole orchard, by which means they will root about the trees, so as to keep the ground clean, loose and open, and likewise give them a considerable manuring. It is constantly observed, that when the stem of the tree grows too fast for the bark, it causes blotches and lacerations; which evil is properly avoided by scoring the bark with a sharp knife; but care should be taken not to go to the wood by cutting through the whitish rind or inner bark. A great enemy to apple trees in many parts of the country, is the caterpillar. The method of destroying them, is to go early in the morning and twist their nests out of the trees with a forked stick or long pole. It is said by a respectable farmer, that by placing a large clod of dirt in the fork of an apple tree, or by tying dirt or salt around the body of the tree, that all the caterpillars will immediately desert, and will not crawl over the dirt again to get into the tree.

But they are so easily destroyed by the former method, that it should be considered nothing but laziness in a farmer who permits his orchards to be injured by these insects. Apple trees are very often almost entirely ruined by moss, which kills many, and injures others so much, that they are only an incumbrance to the ground and a disgrace to the country. This evil may easily be checked, by scraping and rubbing off the moss in the spring of the year, with a rough iron scraper. If the ground, if too wet, or retentive of moisture, will sometimes

prevent or cure moss; or digging round the trees on the approach of winter, or in spring, and bringing fresh mould; or the scouring of ponds, or the earth ploughed up on the site of long standing fences and laid round them. Whatever contributes to the health of trees, will cure, or in some degree mitigate this and other diseases.

In gathering apples we must consider the climate in which we live, and direct our practice according to the degree of heat or cold. In hot countries the fruit must be gathered sooner than in colder ones, because the sap has performed its work sooner.—*Fruit will keep longer* the longer it is suffered to remain on the tree. We should gather fruit after a frost, for we are then sure the sap will no longer yield it. This consideration merits more attention, perhaps, than has hitherto been paid it.

After all, many excuse themselves from paying much attention to their orchards, by saying "they are not worth it." Herein they are mistaken.—Were orchards properly cultivated, and the cider produced from them properly made, every farmer would find that no pains or attention which he could bestow upon his orchards would be too great. In the northern states, the farmers discover that they cannot pay too much attention to their orchards.—There they have almost completely substituted cider for ardent spirits; and this wholesome beverage is to be found on their tables little inferior to the best wine, throughout the year. I have before observed, that good cider would be a national saving of wealth, by expelling foreign liquors, and of life, by expelling the use of ardent spirits. And I consider apples, under all their varieties, the length of time they may be preserved, and the many uses made of them, not only the most valuable of all our kinds of fruits; but perhaps of more real value to the people in general

than all the other fruits. Besides these considerations, the pleasure and delight which a farmer must experience in the cultivation of an orchard, exceeds perhaps any other belonging to his pleasing and happy pursuit.

PEACH TREES.

No. XXXIV.

The Peach may be ranked with the most delicious fruit that can be produced in any country. It is generally raised from the stone, but the best kinds are those propagated by innoculation or grafting.

The peach tree is subject to many calamities, and is in general short lived: its preservation to any considerable age, is only to be ensured by skill and attention—its precious fruit, is, therefore, forbidden to the slothful, the negligent and the ignorant.

The peach tree is liable to three misfortunes or calamities—first, the fly—second, the breaking of limbs which brings on a decay—third, the wounds received on the body by bursting of the bark by severe frosts in winter, and the injuries done to it by birds, insects, &c.

But the most general decay of peach trees, is owing to a worm which originates from a large fly, that resembles a common wasp. This fly perforates the bark, and deposits an egg in the moist or sappy part of it. The most common place of perforation is at the surface of the earth where the rough bark and under bark which is exposed [illegible] begins to change to the softer character of that which

covers the roots. In this particular part the fly is able to puncture the surface, and there introduce its eggs. Thus they perform in our climate from the middle of July through August and September. In August, for the most part, the worms assume the chrysalis state, and in eight or ten days are transformed into flies. Then they immediately begin to deposit their eggs, which are soon hatched into worms, and thus the round of transformation common to the insect tribe is completed. The eggs deposited by the fly at the times and manner just stated, are changed into worms; and it is in the worm state they do the mischief, by preying upon the soft inner bark of the tree, which is the medium of circulation for the sap, thus interrupting the flow of the sap—the immediate consequence of which is, the destruction of the fruit, and finally the destruction of the tree. Gum issuing out of a peach tree at or near the surface of the ground, is a sure sign that there are worms under the bark.

Various means have been resorted to, and with various success, for the purpose of destroying these worms, or of preventing them from doing injury to the trees. These various methods shall now be given as practised by some of the most respectable and distinguished farmers of our country.

DR TILTON, OF THE STATE OF DELAWARE

I shall say but little on the cultivation of this useful tree; but will barely remark, that it should always be planted shallow, with the soil raised about it in the form of a hill; that Forsythe's method of heading down the trees a year or two after planting, insures the most vigorous growth: and that tilling the ground, for some years after setting them out in orchards, is essential to the rapid and successful growth of the trees. The diseases and early death

of our peach trees, is a fertile source of observation, far from being exhausted. Among the insects which are great enemies to these trees is a little beetle, called curculio, about the size of a pea bug, which punctures the fruit and occasions it to fall off and rot before it comes to maturity. These insects may be exterminated by means of hogs. This voracious animal, if suffered to go at large in orchards, and among fruit trees, devours all the fruit that falls, and among others, the curculios, in the maggot state, which may be contained in them. Being thus generally destroyed in the embryo state, there will be few or no bugs to ascend from the earth in the spring to injure the fruit. Many experienced farmers have noted the advantage of hogs running in their orchards. The best method of destroying the wasp-like insect (which bores the bark of the tree, and deliquus in that region just below the surface of the earth) that I have ever employed, is to draw the dirt from the root of the tree, in the fall, and pour boiling water on the roots. In the spring, my practice is, to return the soil to the tree, in the form of a hill. By means of this sort, a tree may be preserved many years.

RICHARD PETERS. PENNSYLVANIA.

The worm or grub, produced by the wasp, depositing its progeny in the soft bark, near the surface of the ground is the most common destroyer of the peach tree. I remove the earth a few inches round the tree in August or September. After July the wasp ceases to pierce the bark and to make its deposits. I pour round the butt of the tree, beginning about one foot above the ground, a quart or more (not being able about the quantity) of boiling hot soapsuds or water. This kills the egg or worm

lodged in the tender bark; and, of course, prevents its ravages the next season. I also have the trees bared at the roots and exposed to the winter. I have lost some in this way; but I still continue the practice. I have been in the habit of doing this for ten or twelve years, and prefer it to any other treatment. To supply deficiencies, I plant young trees every year. When trees become sickly, I grub them up; I find that sickly trees often infect those in vigor near them, by some morbid effluvia. The young trees supply their loss, and I have no trouble in nursing those in a state of decay: which is commonly a hopeless task.

WILLIAM COXE, BURLINGTON, NEW-JERSEY.

I always search the roots of my trees twice in the season, last of July and September. On the first of October, I open the ground around the roots so as to leave a basin of the size of a common wash basin—in this state they are left until the next spring—the ice and snow which fill the hole during winter, effectually kills the worm should it have eluded my search. I also endeavor to prevent the limbs from breaking and from excessive bearing, by close pruning, which I have long found more efficacious in peach than in any other fruit trees.

JOHN H. COCKE, VIRGINIA.

I think I have discovered a remedy for the worm which preys upon peach trees at or near their roots, and which is so destructive to their existence.—This remedy consists in tobacco. As much cured tobacco as is tied up in a bundle, viz: from four to six leaves, is sufficient for a tree. The tobacco in a moist state, so as to render it flexible, is bound around the body of the tree just at the surface of the earth, encircling the part where the fly deposits its eggs. This precaution is to be taken before the

hatching of the flies—the first of July is early enough, but to make the experiment successful it should not be put off longer than this period. The tobacco, so primary deleterious to the insect tribe, is so also to this destructive fly, and thereby prevents its approach.

My first experiments with tobacco were confined to ten or twelve peach trees; the next spring I found that the trees still threw out gum near the surface, and I feared my experiment had failed; upon a close examination however, I perceived that the gum had issued out from the old wounds of the former year, which were not yet entirely healed. The last summer I again applied the tobacco, and this spring have assiduously examined the trees—Upon the whole, I find that those trees which have enjoyed the benefits of the tobacco application for two years, have all their wounds entirely healed and throw out no gum; and in no instance have I found the worm to have existed, when the tobacco was applied. From these facts, it is evident that tobacco stalks, when stripped of their leaves, would be excellent to throw around the roots of fruit trees.

CIDER.

No. XXXV.

As this is a general fruit year, and much cider is intended to be made, it will no doubt be acceptable to farmers, to state the best modes of cider making. It is much to be lamented that so little good cider is made in this state, which must arise from inattention to the subject, or from a want of knowledge of the best modes of making it; owing to one or other of these circumstances, many permit their apples to rot on the ground or to be given to their hogs, whereas were they converted into cider, properly made, it would keep good the year round, affording for the table a wholesome and agreeable beverage little inferior to wine, and by many preferred to it.

In the northern states, the art of making good cider is so well understood, that almost every farmer has it by him the year round, and to their general use of cider, instead of ardent spirits, we may, in a measure, ascribe that temperance, health, and morality, for which they are remarkable. To encourage the manufacture of good cider, and to prevent its conversion into ardent spirits, by distillation, as much as possible, the latter of which is proving a curse to our country in the most lamentable manner, I will proceed to detail the best modes of making cider, as practised by the best cider makers in the northern states.

One of the first errors with respect to cider is, gathering apples when wet; the second is, throwing them together exposed to sun and rain, until a sourness pervades the whole mass; thirdly, making so large a cheese that fermentation will come on before

the juice can all be pressed out: for certain it is, that a small quantity of the juice pressed out after fermentation comes on, will spoil the product of a whole cheese; and fourthly, permitting cider, after it has undergone fermentation or working, to remain on the lees, instead of racking it off. If, then, either of the above circumstances will spoil the cider, which I know to be the case, what must be the effect of a combination of the whole, which frequently happens.

Having pointed out the errors to be avoided, I now proceed to state the methods to be observed in the making of good cider.

Gather the apples that are intended for cider, when they are perfectly dry, and lay them down in layers, in the cider house and other outhouses on floors, not exceeding two feet thick: where there is space sufficient, thinner will be preferable, for the object is to promote the ripening of the fruit, and the evaporation of the watery particles. In this situation they are left about two weeks, secured from rain and wet, but exposed to the air as much as possible, when they are again to be sorted, the rotten ones thrown out, and the sound ground in the mill or beat—here it will be proper to observe that the mill, the press, and all the materials used, be sweet and clean, and the straw clear from must—The pumimice is then laid in troughs for 12 or 24 hours; this tends to sweeten the juice, enrich the cider and give it a fine amber color. But the time in which the pumimice remains in this state, must be regulated by the state of the weather, without measuring the length of time by hours; for it is evident that at one season the same length of time will produce no sensible effect, which at a much warmer season would induce the commencement of an acid fermentation. As soon as

the juice is pressed out, the great art in making cider commences, as nature begins to work a wonderful change in it. The juice of fruit, if left to itself, will undergo three distinct fermentations, all of which change the quality of this fluid. The 1st is, the vinous; the 2nd, the acetous; and the 3rd, the putrid. The first fermentation is the only one which the juice of apples should undergo, to make good cider—It is this operation which separates the filth from the juice, and leaves it a clear, sweet, vinous liquor.—To preserve it in this state is the great secret: this is done by racking it off from the lees or dregs, fumigating it with sulphur, which checks any further fermentation, and lastly, by fining it.

The juice, as it comes from the press, should be placed in open headed casks, or in the largest vessels which can be procured, in which it should remain until the fermentation ceases. The person attending may, with great correctness ascertain when this first fermentation ceases—this is of great importance, and must be particularly attended to.

The fermentation is attended with a hissing noise, which is heard by putting the ear to the bung hole, or in open headed casks, by observing the bubbles rising to the surface, and there forming a soft spongy crust over the liquor: when the hissing noise ceases, or the crust begins to crack, and a white froth appears in the cracks level with the surface of the head, the fermentation is about stopping. When the fermentation has entirely subsided, the liquor is fine and clear, and is then in a proper state to be drawn off, *and if then neglected*, the particles of pumice that had settled down to the bottom of the cask, will, during a warm or damp state of the weather, rise up again, mix with the juice, and thus produce a second fermentation, which is always acetous and injurious to the cider.

The cider should therefore, immediately after the *first* fermentation ceases, be drawn off into sweet, clean casks or hogsheads that have been well scalded and rinsed. To preserve the cider in its fine vinous state, and to check any further fermentation, it must be fumigated with sulphur. To do this, take a strip of canvas or rag about two inches broad and twelve inches long; dip this into melted sulphur, (brimstone) and when a few pails of worked cider are put into the cask, set this match on fire, and hold it in the cask until it is consumed, then bung the cask and shake it, that the liquor may incorporate with and retain the fumes; after this, fill the cask, and bung it perfectly close by running pitch over the bung, so as entirely to exclude the air.—Cider thus prepared will keep good and sweet until late in the spring, and if not consumed by that time, and intended for sale or further keeping, it must undergo the following more particular process.—

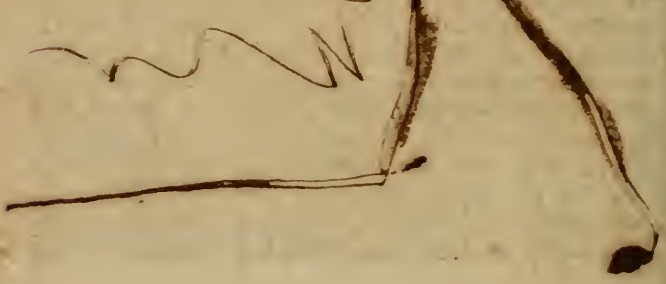
At the time of fining cider there should not be the least degree of fermentation; and perhaps the best time for fining is, in the winter, in steady cool weather. Draw off some gallons of cider, proportioned to the quantity of cider to be fined, into a vessel, to this add of Isinglass pounded and unravelled into shreds, about two ounces to the hogshead, containing 112 or 115 gallons, or an ounce to a barrel. The liquor with the Isinglass is frequently stirred up for three or four days, so that it is completely diluted into a thin jelly, and is then strained through a fine hair sieve. The fining may now be added to the cider without drawing it off, but the best general practice is, to pour your fining into the empty cask, and then draw off your cider and pour it on the fining.—This leaves behind, a great part of the sediment, checks incessible fermentation, and mixes intimately the cider with the fining. The cider thus

fined, will generally become fine and bright in eight or ten days, and should then be drawn off from the lees of the fining, and bunged close or bottled—If drawn into casks, they should be bunged close and pitched over the bung to keep the air entirely out.

To do this effectually, after the bung is carefully driven in, bore a gimblet hole near the bunghole, and leave it open until you have covered the bung with the cement, to admit the air below, increased by the warmth of the cement, to pass off; when the cement is cooled and hardened, the gimblet hole is completely closed by driving a white oak square plug into it. When bottled, by cutting off the corks even with the bottles, and dipping its mouth into boiling pitch, it is as completely closed, as the best bottled claret or burgundy.

It will also be proper, previous to closing up the cider, to put one large and not more than two raisins to each bottle and a proportionate quantity to each barrel.

Cider thus made, will keep good for years, and will exhibit that sparkling or bounding up, when poured into a glass, so pleasing in the finest Champaigne wine.



IRRIGATION.

No. XXXVI.

The watering or artificial flooding of land, and particularly of grass grounds, is an item in agricultural economy, which particularly deserves the attention of the husbandmen. If to a spirited improvement of the soil, an equal attention was paid to floating, flooding or watering of grass grounds in every part of this State, wherever the situation will admit, perhaps I shall not advance too much, if I say, that few States would exceed ours in the value of our agricultural products.

The subject of irrigation will, perhaps, appear of greater magnitude than people in general are aware of, the more it is examined; for I conceive it may be said to lie at the foundation of most improvements in agriculture: because if manure is accounted the prime article in husbandry (and few people will deny the truth of the observation) I apprehend it will be found that this same watering of the ground is, and may be made, the source of more valuable manure than any thing else; and as the capacity of maintaining stock is the basis of the prosperity of a farm (which may be laid down as an axiom in rural science) so this capacity can only be fully acquired by attending to irrigation and the production of grass. But what renders the practice of irrigation still more inestimable is, that it draws manure from materials, which, without this process would be entirely lost: because those rivulets that are productive of such astonishing effects (by turning water overland) are conveyed, unobserved, down their streams to the sea; and consequently lost in that vast collection of wa-

ters. Now, the watering of land, in a proper manner, not only raises an amazing crop of hay, but earlier spring eatage and a more plentiful latter-math.—The hay again, properly consumed, makes a large annual return in dung or manure, which can be employed to great advantage on such parts of the farms as most need it; because the watered meadow requires no other help but repeating the same process as often as necessary, while it repays the expense and toil bestowed upon it in the most grateful manner, by plentiful and certain crops of hay, year after year, and instead of being exhausted, becomes richer or more productive.

Water is absolutely essential to vegetation; and when land has been covered by it in the winter, or beginning of spring, the moisture that has penetrated deep into the soil, and even the subsoil, becomes a source of nourishment to the roots of the plants in the summer, and prevents those bad effects that often happen in lands in their natural state, from a long continuance of dry weather.

The advantages of irrigation, though so lately a subject of much attention, were well known to the ancients; and more than two centuries ago the practice was recommended to the farmers of Great Britain by Lord Bacon: according to the statements of this illustrious philosopher, "meadow watering" acts not only by supplying useful moisture to the grass, but likewise, the water carries nourishment dissolved in it, and defends the roots from the effects of cold.

I shall proceed to make some further remarks on irrigation, in order to induce the farmers of this State to benefit themselves by this most useful, tho' I am afraid, hitherto little understood improvement. There are many parts of almost every farm that might have water conveyed over them, either on a small or large scale, and to very great advantage: for every

little brook or rivulet is capable of being thrown over the adjoining grounds, more or less in proportion to their descent: the more descent, the more land can be overflowed.

In order to manage this important branch of rural economy with success, it will be requisite first to ascertain whether there is fall or descent enough in the stream to irrigate a sufficiency of the adjoining land, to make the object worth undertaking and whether it will admit of a dam being thrown across it to sustain or increase the fall; and secondly, whether the water can be carried off with the same facility as it is conducted on the soil. The second consideration is a very important one; for if the water cannot be conveyed off, it will stagnate on the meadow which would be productive of the worst consequences; as the turf would become rotten, the soil be soaked without being ameliorated, and the land produce only coarse grass rushes, or other aquatic weeds. The level of the stream should be taken, which may be very well done by means of the rafter level used in horizontal ploughing, a ditch or race is then to be cut on the tract of the level as high up the head land as the fall of the stream will admit, allowing however descent enough to give the water a gentle current; the depth and width of the ditch or race will be regulated by the quantity of water it is to contain and the number of acres to be irrigated, to be continued on the level as far as may be convenient or necessary, and then let into the stream from which it was taken; the interior side of the ditch or race should be of the same height throughout its whole length, in order that it may be the same distance above the water in every part which need not be above three or four inches. Sluices are to be made from the main ditch leading through different parts of the ground, the number of which, with their

ramifications, their direction and distance from each other will be regulated by the situation of the ground; they should however be so disposed as to bestow an equal distribution of water on every part of the ground. When the main ditch is on a strict level and there is water sufficient to flood the whole at once, a gate at the further end will answer for this purpose: but if the water is scanty, there should be gates in each sluice from the main ditch by letting up one of the gates for the space of ten days, at the expiration of which time it is to be let down, and so on with the others alternately, for a similar period, each division will receive a proper share of water in its turn, and derive from it equal benefit.

Some attention should be paid to the time and manner in which the water is applied. In December and January, the chief advantage consists in keeping the land sheltered by water from the severity of the frosty nights. In February, if the water remains for many days, a white scum arises very destructive to the grass; and if the land is exposed without water to severe frosty nights, the greater part of the grass will be killed. The only way to avoid this is, to take off the water and turn it in over night, or to take off the water early in the morning, and if the day be very dry the frost can do no injury; for it is only when the grass is wet that frost has this pernicious tendency. The advantages of irrigation are not confined to grass grounds, but may with equal benefit be extended to horticulture and field culture. Gardens are rendered doubly valuable, if a stream can be conveyed into them to supply that deficiency of rain which vegetables so frequently need in dry springs and summers. The best means of supplying this deficiency or the regular demands of vegetative succession, particularly to the vine crops through a droughty season, are by cotton

or wooden syphons; other kinds of garden vegetables may be benefited by overflowing the ground, which is best done late in evenings. The advantages of irrigation have been little experienced in this country in the field culture; yet in Europe they are enjoyed upon an extensive scale: and the improvements and arrangements which they have made in many parts of that country to irrigate their farms, must excite the wonder and praise of every lover of the rural art.

Birkbeck's account, in his travels, of the manner of irrigation in the Southern part of France, is highly interesting: a short exract from his remarks on this subject shall be given, and perhaps they may awaken considerations in the minds of some of my readers, which may be turned to good account.

"We had an opportunity of witnessing the wonderful effects of irrigation under the fervid sun of this rich climate. The copious and pure streams issuing from the Pyrenees, from their source to their union with the Mediterranean, are most economically and skilfully directed to irrigation. On the mountain sides, the streamlets, as they trickle from the rocks are collected into channels above every little portion of arable land, which they render surprisingly fruitful. These rills uniting form larger streams; and these with great labor and ingenuity, are kept up by artificial channels, and only suffered to descend as they perform the office of irrigation. The same attention is paid to the larger streams, which united become a considerable river. This is divided and subdivided, moves, and is again divided, so that every portion of the surface seems to enjoy its due share. The manner of applying the water is extremely simple. A dam is made across the upper

channel, from which the water flows gently into a furrow made by the plough along the higher side of the field, and in a few hours soaks through the whole soil, until it reaches the lower side, which completes the operation."

THE IMPORTANCE OF AGRICULTURE.

No. XXXVII.

The want of a due estimation of the pursuits of Agriculture, is, in many countries, a grand impediment to its progress. Where the cultivation of the soil is regarded with contempt, or as beneath the attention of men of standing and education, it will be entrusted to the management of persons of narrow capitals and still narrower minds. Such prejudices operate in various places. In almost every part of the United States they are fortunately rapidly dissipating, and agricultural pursuits are viewed, as they should be, as the basis of our strength and prosperity, and therefore, worthy the attention of the wise and good.—Many of our best citizens, who were distinguished in the field and in the cabinet, are now to be found on their farms, devoting their time and attention to the occupations of husbandry, as the surest means of gaining an honorable subsistence and of doing good to their country, by thus encouraging and patronizing this first of arts.

An idea, however, yet too generally prevails, that young men, and many of those who have fine landed estates, must of necessity study and pursue some

public profession, the pursuits of agriculture being too low and mean to engage their talents and attention.

Agriculture, when skilfully pursued, is calculated to call into action every noble and improved faculty of the mind, and is capable of being aided by the most interesting branches of the sciences; and in the late improvements which it has undergone, it has been shown that some of its most important principles are derived from, and may be illustrated by chemical doctrines. The objection, therefore, that young men would have no employment for their talents and learning, were they to engage in the pursuits of agriculture, is entirely groundless.

I consider the irresistibly to the magnitude of the subject, to be the greatest obstacle in the way of improvement, which agriculture has to encounter.—The first preparatory step towards its improvement, is to satisfy the minds, not only of farmers, but of the community at large, that it is an object of primary importance; and not attainable in perfection, by mere farmers. If this be not accomplished, efforts to introduce any thing like system, or principle, will be abortive indeed.

A *farmer* should be considered, by himself as well as by all other members of the community, as one placed in a situation to perform the most beneficial services to the public, by exercising a calling in which all other citizens are materially interested. He may be, personally, no better or worse than others; but the art in which he is engaged, is the most essential of all others, to the general welfare; an art which should be respected and supported by all manner of citizens. Agriculture having been not only the first of *Arts*, in priority of time, but the best in the estimation of the wisest and greatest men in every age, should ever be deemed the first of the

both of public and private attention. Power, especially that delegated by the people, should extend its arm, and open its hand, for its aid and protection. Wealth should unlock its coffers for its encouragement: science and every mental acquirement should be liberally bestowed, when instruction is required, as it always has been, by the rulers of the earth; whose occupation in a great degree, secludes them from opportunities of gaining scientific knowledge, and a capacity for philosophic research. Commerce should yield to the support of Agriculture, a share of those profits whereof it is the source; and Manufactures should bestow a willing tribute to the art, on which their subsistence depends. Those who devote themselves to the learned professions, should render to it, both homage and contribution. Their usefulness, or gains, would be small indeed, among shepherds and hunters—and those were for the most part, the employments of man, before agriculture widely diffused its blessings, and mainly contributed, not only to the civilization, but to the happiness, wealth, subsistence and safety of our race. Those who minister at the *Altars*, and are our instructors and examples, in our most exalted concerns, are also bound to animate, instruct, and encourage the cultivators of the soil. Many of them, in other countries, have been highly meritorious, both in precept and example, on this subject. And they peculiarly know, that the exercise of this art, is venerable for its antiquity;—was enjoined by a dispensation of Providence, and established by an ordinance of Heaven.

Those who have a permanent residence in our towns and cities, should be more convinced, than they have hitherto been, of the obligations they owe to agriculture. Their daily subsistence, and their necessary comforts and even luxuries, depend, either directly or consequentially, on this first of arts.—

The better the style of husbandry, the more benefits they derive from it. It is no reasonable excuse for withholding their assistance, or encouragement, that they are not agriculturalists. They possess, and should bestow, the means of promulgating encouragement and information to those who are engaged in the labors of the field.

On us, whose happy lot is cast in a free country, the extention and encouragement of agricultural improvement, is most impressively incumbent. Montesquieu has, with truth, observed, that "countries are not cultivated in proportion to their fertility, but to their liberty."

The Athenians, among the first of the Greeks who acquired a free government, and the polish of civilization, and science, were famed for their knowledge in agriculture. Xenophon, one of their distinguished citizens and celebrated historians, has many ages ago remarked, that "Agriculture is the nursing mother of the arts. For, where it succeeds prosperously, there the arts thrive: but where the earth neglectfully lies uncultivated, there the other arts are extinct."

In the early periods of the Roman Republic, when liberty was a substantial blessing, and not an empty sound, the highest praise that could be given to any citizen, was to say of him, "that he well cultivated his spot of ground." And the leading properties of her greatest men, were to cast off their robes of state—lay aside their truncheons, and ensigns of power—to "cultivate their spot of ground."

Let it not be understood, that the encouragement and improvement required for agriculture, is intended for the more personal emolument of the farmer. Those who take an incorrect or improper view of

the subject, allege, that "farmers are doing well enough,—and want no improvement."—Every one acquainted with political economy, knows well, how extensively it adds to the general advantage of the community, when the same portion of labor is made to produce an increased number and quantity of supplies. And eminently distinct from all other employments is that of the husbandman, which brings into existence, by a kind of creation, additions to the public stock, drawn from the earth. Whereas most, if not all other occupations, are employed on materials pre-existing. *Farmers* are truly called, by the best writers on political economy, "the productive class," whilst all others are justly styled, "the unproductive classes" of the community.

It is not necessary to cite opinions, or proofs, from great authorities, to show that whilst able and intelligent farmers enlarge the mass of property and wealth in the society in which they live,—they also increase the public security and happiness.

It will be seen at once by every one who passes through a country productively and neatly cultivated—that quietude, contentment, morals, and exemplary submission to law and good government, are strikingly conspicuous. But in a district inhabited by a negligent, indolent, and *ignorant* population, the picture is disgustingly, and even dangerously, reversed. So that it behoves every good citizen, for his own security, as well as from motives of patriotism and moral obligation, to assist in furnishing the means of warning the negligent, stimulating the indolent, and enlightening the ignorant husbandman.

HINTS SUGGESTED FOR THE IMPROVEMENT OF AGRICULTURE IN N. CAROLINA.

No. XXVIII.

It must be the cause of deep regret to every real friend of North Carolina to see the state of Agriculture among us reduced to the lowest ebb—thousands of acres of land are annually destroyed—and our best citizens are destroying their exhausted farms and emigrating to new countries.

Agriculture, instead of being pursued upon the rational plan of improvement—instead of being brought into notice, respected, encouraged and patronized—is, on the contrary, followed upon principles destructive to the land, and therefore, destructive to the strength and prosperity of the State, and remains neglected and degraded.

Why is agriculture thus neglected and degraded in North-Carolina?—Our soil and climate, (generally speaking) are equal to those of any of our sister states—and are happily calculated to reward the labors of the husbandman in the most bountiful manner. Our State is intersected with numerous rivers, intended by nature as so many links to bind us more closely together in a friendly and commercial intercourse—and to encourage the cultivators of the soil to increase its various products, by affording them a quick and cheap transportation to market. In other states enjoying no better natural advantages than we possess, we see agriculture flourishing—population increasing—every man bound and endeared to his native spot, because from it he derives ample subsistence, comfort and happiness.

Why is this not the case in North-Carolina? It may be traced to two causes—a neglect in the State of rendering her rivers navigable—and to a want of knowledge among farmers as to the best modes of cultivating the soil—and a zeal and emulation to effect improvements therein.

Wise governments have, in all ages, bestowed particular attention towards improving the navigation of rivers and cutting of canals, as being objects of the first importance; as they particularly promote the prosperity of agriculture, upon which the strength and independence of every nation must depend.

In all countries where agriculture has flourished, it has been found, that its prosperity was promoted in proportion to the increase of internal improvements. Nothing gives a more elastic spring to agriculture, than roads, canals, and interior navigation. They open new channels of communication—new fronts to property—and stimulate improvements, not only in husbandry—but to all branches of employment, to which labor and capital are profitably applied.

Mr. A. D. Murphey, in his Report on internal navigation to the Legislature of 1815, pourtrays, in just and vivid colors, the advantages which would accrue to North Carolina, from the improvement of her rivers. He observes, that by these improvements the blessings of the government are brought home to every man's door—that the comforts, the conveniences of life, are increased—the public labor is rewarded—and that the wealth of the state keeps pace with the wealth of its citizens—that the value of our lands would immediately be doubled, and the PRODUCTS OF OUR AGRICULTURE increased three-fold. That steady habits of industry would be established—and the consequent morality which would follow those habits—and not the least of all, the abundant

revenue which would accrue to the State, thereby allowing to the Legislature the means not only of lessening the public burdens, but of providing effectually for the establishment of Schools in every part of this State, and of making ample provision for the cultivation of the sciences and the arts.

This gentleman has not only described the advantages to be derived to our state from these improvements, but he has also devoted his talents and best exertions towards effecting them, in order that these advantages may be realized. He is, therefore, entitled to the gratitude and honor of North Carolina, and deserves to be ranked as the most eminent of her patriots and benefactors.

Every other citizen of this state should also feel bound, from every motive of patriotism and self interest, to encourage and promote, by every means which lies in his power, these great improvements.

2. It has been stated that the wretched system of agriculture existing among us, was also owing to the want of information in farmers, as to the best modes of cultivating the soil, or of emulation and zeal to make improvements. To test the correctness of this opinion, we need only cast our eyes over the state, and observe thousands of acres of land completely worn out, washed into gullies, and turned out as a common—fields and farms in a state of wretched fallows—producing scanty crops barely worth the labor of cultivation—the system of farming itself being one of exhaustion and impoverishment, instead of renovation and improvement. That the proprietors of the soil in this state, should have left the subject of agriculture so long in a state of almost total neglect and inattention, has always been to me, not only a source of poignant regret, but of utter astonishment. No land-holders of our country exist, and a great proportion do not cultivate, in intelli-

gence, education or mental acquirement. Yet they have suffered the cultivation of the soil, upon which not only their own subsistence and happiness depend, but that of their posterity, to remain without change or amelioration, from generation to generation.

I mention not these things with reproach, but with the deepest regret; for, as a citizen of North-Carolina, I feel deeply interested in the prosperity of her Agriculture, upon which her strength, independence and importance, as a state, must depend.

There is no method by which the improvement of Agriculture in North-Carolina could be so effectually achieved, as by the establishment of Societies for promoting the knowledge of its principles, and encouraging and exemplifying its best modes of practice, in all quarters of the state. Each society should provide a well selected library. Agriculture should be the leading subject. Selections from the best writers on husbandry, might be introduced as school books, to make early impressions on young minds. Other subjects may be interspersed in those libraries, to entice our farmers and their families to read; and thus conquer their antipathy to what they contemptuously call, book-farming.

Premiums for excelling, and honorary notices, would rouse and reward a spirit of emulation, which is the great source of improvement. All subjects of difference—especially on political questions, should be avoided; and Agriculture be considered the rallying point of good citizenship.

The establishment of Agricultural Societies in other States and Countries, has been attended with the greatest advantages.

England has made most rapid improvements in agriculture since the establishment of the numerous

agricultural societies, which are now scattered over that kingdom.

The Philadelphia Society established at Philadelphia, the Berkshire Society at Pittsfield, (Mass.) and the Massachusetts Society at Boston, are doing great good in those parts of our country.

These societies, by circulating pamphlets and books on Agriculture among the people—and the two latter by offering premiums—have stimulated farmers to enquiry; to adopt improvements; to increase exertions: and to produce the greatest industry, economy, and good management.

They have also excited useful discoveries in the mechanical department, in reference to ploughs, harrows, rollers, mills for cleaning wheat, mills for threshing wheat, and machines for cutting to chaff, straw, corn-stalks and hay. They have also promoted a spirit for improving the breed of neat cattle, sheep, swine, horses and mules.

These societies have also awakened their fellow citizens from the torpor of ancient habits—and have infused into them a spirit of useful enquiry, and an ardent and persevering spirit for improvement.—And they have, by premiums, excited a spirit of emulation, and a desire to gain knowledge of practical husbandry—breeding of domestic animals—improving and neatly cultivating farms—increasing in quantity, quality and workmanship, household manufactures—raising the cleanest and best crops, actually viewed and examined by committees, making progress for that purpose, introduced a style of Agricultural improvements, uncommon and highly exemplary. I have been the more particular in stating the great and important effects which have resulted from the establishment of these Societies, in order that it may have a tendency to rouse the people of

this State to the establishment of such highly useful institutions.

This subject certainly merits the attention of our best and most distinguished citizens; and, I trust, that they will clear the way and pursue the object with patriotic zeal.

Many great improvements in Agriculture must be made in this State, to produce a change for the better. Our worn-out and exhausted lands are to be improved; swamps and marshes are to be drained and converted either into tillage or grass—our piney barrens are also to be converted into cultivation, or into some kind of grass adapted to such soil.

There is no system so likely speedily to reclaim our exhausted lands, as inclosing, combined with the use of plaster and clover.

By inclosing lands and excluding grazing from them, they will soon throw up a luxuriant coat of vegetation and growth of bushes, which will shade the ground from the scorching rays of the sun; and by turning under the former with the plough and using the latter for filling up gullies, such lands will improve under this system beyond the expectations of the most sanguine imagination. But if plaster and red clover are used in combination with inclosing, exhausted lands are speedily reclaimed and brought into good heart for the production of any crop. This fact is so fully confirmed by the experience of thousands in the different parts of Virginia and Pennsylvania, that to doubt it, would be to doubt truth itself.

Many in those parts of our union recollect the forlorn situation of their old settlements, before the plaster and clover husbandry was introduced and became general; who have now the enviable happiness of viewing their fields transformed from barrenness to fertility, and grown fruitful and durably profitable

under the labors of their own hands, by means of these two great auxiliaries to our agricultural prosperity.

Among the advantages which would accrue to our State from the improvement of our rivers, would be the ease and cheapness with which Plaster of Paris and lime could be procured by our farmers, for the purpose of improving their lands.

To aid these improvements, the grasses should be brought more generally into cultivation among us; they have hitherto been too much, or I might say, almost entirely neglected. By cultivating them, we should raise more bread and more meat; by cultivating them, in preparing meadows and well turfed standing pastures for stock, we should be enabled to exclude the tooth and the hoof from our arable lands, and thus rapidly facilitate their improvement under the inclosing system.

The present mode of supporting stock is principally from the corn house. By neglecting the culture of grasses, the stock is maintained (if well maintained) at more than double the expense that it might be by a proper attention to grass; and the land, at the same time reduced to poverty, that would otherwise be enriched by such attention.

Among the many artificial grasses, which the recent improvements in Agriculture have brought into cultivation, there are several which will be found to be well adapted to our soil and climate. Herds grass, red top, orchard grass, and tall meadow oat grass—the two former for wet and low lands and the two latter for high and dry places, would be valuable acquisitions to every North-Carolina farm.

INDIAN CORN.

No. XXXIX.

Indian corn, or maize, is the most valuable crop in cultivation among us, in whatever point of view it is considered. It not only produces a greater quantity of grain product for man than any other crop, but also of vegetable matter for beasts and the earth. It is not only the most valuable, take it with all its advantages, but it is of all crops, generally the most certain. It defies drought and wet, and if it fails, some most uncommon seasons or circumstances occur. It necessarily requires the soil to be kept clean; and is consequently the best crop to subdue a stubborn, or clean a foul soil. It forces us to farm well, which renders it the best preparatory crop for small grain of any other. An eminent agricultural writer* has placed the high value of corn in a conspicuous light; he correctly terms it both 'meal, meadow and manure; to its right to the first title, almost every tongue in the largest portion of the United States can testify; to the second, an exclusive reliance on it for fodder or hay, in a great district of country during two centuries, gives conclusive evidence; but the exhausted state of this same country disapproves its claim to the third, or disallows any pretension of its inhabitants to industry or agricultural skill.'—The general opinion appears to be entertained among farmers that corn is an exhausting crop, than which nothing can be more incorrect. The reasons for this opinion are to be charged to the ignorance or unskilfulness of farmers in estimating the value of corn,

* Col. John Taylor—see his Arator.

or their manner of cultivating it, and not the plant itself. Indian corn being a very powerful plant, is capable of contending with an impoverished soil; and when tolerably cultivated, will remunerate the farmer on grounds incapable of producing crops of almost any other description equally valuable, and the farmer abuses this plant as an impoverisher, because it continues faithful until the last dying gasp of the soil, which his avarice has destroyed. In determining whether a crop of any kind improves or impoverishes the soil, we must consider the offal or vegetable matter which it affords, as carefully returned back to the soil in the form of manure, and whether this will not compensate for the nutriment drawn from the earth in the growing state of the crop. I think, according to this principle that Indian corn, instead of being an exhausting, will be found to be a highly improving or compensating crop to the earth. There is no other crop which yields so great a quantity of offal or vegetable matter as this; in its stalks alone it far exceeds that of any other grain crop: but to the stalks are to be added, its blades, tops, shucks and cobs, each of which will nearly balance the litter bestowed on the land by any other crop.—Instead of restoring to the earth in the form of manure, the vast quantity of litter afforded by Indian corn, we have suffered it to waste and perish, and have continued to cultivate this plant for two centuries past, without giving it hardly one dust of manure, or the land any rest which produced it: and finding that Indian corn would grow year after year without manure, the destructive practice of cultivating it in this way has been continued, until the fields on which it grew have been ruined, and we have unjustly transferred from ourselves to an innocent plant, the cause of their impoverishment.

As surprising as it may seem to some, yet it may be safely asserted, that there is no crop within the reach of the farmer, which is so well calculated to improve an exhausted farm as the cultivation of Indian corn. With good cultivation, an acre of well-manured land, will seldom produce less than fifty bushels to the acre, a product which is no greater to the space than that yielded by any other grain crop. The grain is not only in greater proportion to the space on which it grows than other grains, but the rest of the plant is in greater proportion to the grain, than the rest of any other grain plant. The straw and chaff of the smaller grains, is in weight but about one half of the grain: whereas the corn-stalk, with all its appurtenant offal, is of not less than three times, and if taken early from the field, probably of not less than four or five times the weight of the grain belonging to it. The fodder furnished from an acre of luxuriant corn, may be estimated, in quantity and quality, as equal to a ton of good hay—the tops and shucks go largely towards the support of cattle in the winter months, and the refuse of them in supplying a great deal of litter for the farm yard. But it is the stalks of corn which make it so valuable a resource for re-fertilizing the soil, and as such they merit particular attention, as furnishing such an abundance of vegetable matter for manure.

There is another consideration which deserves to be mentioned in estimating the value of Indian corn as an improving crop, viz. the grain part of its product being mostly and every where distant from navigation, is consumed on the farm on which it is made, from which source will also proceed the greatest quantity of the richest and most valuable manure. Would it therefore be hazarding too much to say, that where a level surface, or the mode of cultivating a hilly one, prevents the rains from carrying off

the soil, a restoration of an *entire* crop of Indian corn, in the form of manure, to the space producing it, would replace the fertility consumed by the crop, and maintain a perpetual productiveness?

INDIAN CORN.

Continued.

No. XL.

The modes of cultivating Indian corn vary in different districts and states, which are no doubt influenced by difference of soil and climate. The manner of cultivating Indian corn with which the author is experimentally acquainted, and which is now spreading through many of the adjoining states, is according to the system detailed in Taylor's Arator. This system has been fully tested by experience, and is found to possess so many advantages over the old modes of cultivating corn, as to render it highly probable that it will in a short time entirely supercede them. The brevity which I have prescribed to myself in these essays, will only permit me to collect and arrange some of the most leading features of this system, referring the reader to that book for a more detailed account.

The corn is drilled and cultivated in ridges which are ploughed but one way, and that in the direction of the ridges; cross-ploughing being entirely abandoned. The ridges are five and a half feet apart with deep water furrows between them. The field

being once thrown into the position of ridges and furrows, never requires to be laid off again. The middle, or water furrow, is left as deep as possible, when the culture of the corn is finished; and when the field comes again into corn, the list or ridge (by reversal) is made upon this middle water furrow, so that there is a regular alternity between ridges and furrows.

If the field has never been thrown into the position of ridges and furrows, it is best to flush up the ground, viz. to plough it into a flat surface in the fall or winter, and list it in the spring; by which means the whole of the ground will be entirely and well broke up, which could not be so well done by ridging up a flat surface. A field already in the position of ridges and furrows is fallowed up or reversed in the following manner. A large mould board plough drawn by two or more horses, and cutting a sod twelve inches wide and six or eight deep is run on each side of the old water furrow and raises a list or ridge in its centre, on which to plant the corn. These two furrows will leave a slipe of the old ridge, which is split open and the earth thrown each way by a large trowel-hoe plough having a coulter on the point, two mouldboards, drawn by two or more horses and cutting ten inches deep. If the soil is stiff or tough, the first plough ridges on the old water furrow, with four furrows (two on either side.) This ploughing ought to be done in the fall or early in winter; in the spring at the time of planting, on the summit of the ridge or list, a deep and wide furrow is run with a trowel-hoe plough and two mould boards, in which the corn is planted and covered with the foot between two and three inches deep. The distance at which the corn is to be planted will be regulated entirely by the quality of the soil, and must be left to the farmer's own judgment. In land how-

ever capable of producing forty bushels to the acre, it may be planted at five feet six inches (the distance of the ridges apart) by two feet nine inches, leaving two stalks in sandy and three in stiff lands. In low grounds the corn may regularly stand at the distance of from eight to eighteen inches, according to the quality of the soil.

The first tillage given to the corn after planting, is by running a deep furrow by a large mould-board plough on each side of the corn. As the corn is very low, this furrow must be run so far from it, that the earth raised by the mould board will not quite reach it, but be left on each side, so as to form a narrow trough on the ridge in which the corn stands, to be filled up by the hand hoeing immediately following this furrow. Thenceforth the tillage to be performed by the use of skimmers or harrows, and of a central, deep and wide furrow by the trowel-hoe plough and two mould boards, to be repeated when necessary. The whole to be concluded with a narrow weeding or hand hoeing along the slope in the direction of the row, not kept completely clean by the harrows.

In the cultivation of Indian corn, there are two things particularly to be attended to by all those whose object is to make good crops, viz. manuring and deep ploughing. There is no crop which is as speedily and as much benefited by manure as Indian corn. The good crops of corn which are generally obtained from ordinary land, prove how vastly these crops may be increased by making the land richer by manure. The sudden growth of corn upon coarse manure, demonstrates the vast benefit to be derived from litter as coarse and hard as corn-stalks, even whilst their degree of putrefaction is inconsiderable; a fact which should induce us to save and convert every dust of its offal into manure, and manure high-

ly for corn. In its cultivation, therefore, the first improvement required, is to manure it at the usual rate of other crops; and to be able fairly to estimate its value, the land should be in good heart when it receives this manuring.

The second is to plough deeper than we plough at present. The first ploughing, which is to answer the end both of a fallow and a list or ridge on which to plant the corn, is by far the most material part of the system, and indeed, the only good security for its success. The ploughing must be deep and well executed, so as to overturn into the old water furrow, a considerable mass of the litter produced by enclosing, whether weeds or clover.

The Indian corn is a little tree and has roots correspondent to its size, which strike deep into the soil both to procure nourishment and to strengthen itself against severe winds—It therefore requires a deep pasture—and the deeper the ground is ploughed, the more moisture will arise and be retained, which will prove of essential benefit to the crop in seasons of drought. Deep ploughing also saves labor in the cultivation of the crop, whereas shallow ploughing increases it.

By shallow ploughing, the seeds of grass and weeds are kept near the surface ready to sprout up on the occurrence of every warm and moist season, when they appear in millions, and instantly require the plough, however recently used. By deep ploughing, if skilfully done, these seeds which abound most near the surface, are buried so deep as to appear slowly and in small numbers, so that the repetition of ploughing is far less necessary. One or two deep ploughings, according to the nature of the soil, will, with the subsequent use of skimmers or harrows, serve to make the crop of corn; in place of which

four or five shallow ploughings with the same aid, might often destroy it.—[*See Note C.*]

LIVE STOCK.

No. XLI

The possession and proper management of live stock, are perhaps amongst the most important objects which claim the attention of the farmer, as upon these the fertility and prosperity of farms may be said to depend. The mere possession of stock avails but little, if they are not properly managed; hence the latter object will be found to constitute their chief value, not only in bestowing fertility upon the farm, but profit to the owner. A farmer, in carrying on an improved mode of cultivation without live stock, would be in the same predicament with a merchant who wished to carry on an extensive business without a cent of capital; they are in fact the principal agents, when properly managed, by which farms are rendered productive and profitable, and consequently are an indispensable auxiliary in every good system of agriculture. It has been observed by Arthur Young, a distinguished agriculturalist, that "that country, that farm, will be most improved, and most productive, upon which the greatest quantity of stock is kept. This holds good of an acre, a field, a farm, a district, a province, or a kingdom." 'Kept' here alludes to their being *well kept*, viz. providing a due quantity of food proportioned to the number of stock. The value of stock consists in making the land more productive in every thing by

the vast quantity of manure which they afford; but to make them yield this quantity of manure, it is indispensable that they be well kept throughout the year. The manure from a fat herd of stock is far more fertilizing than that from a lean one; and the advantages arising from them on this account are in every respect infinitely greater. The propriety of feeding or fattening stock on the farm with a proportion of its produce, has been well established in the most improved agricultural districts. The vast quantity of the richest manure which they thus yield, imparts its fertilizing power to every part of the farm in its turn. If the crop of corn is consumed by the stock on the farm, there is no question but that the subsequent crops of corn and wheat will be increased by the application of the manure it will furnish, which excess may of itself pay a good price for the corn so consumed. In Great-Britain, the advantages and propriety of this practice are so fully understood, that there is never more than from one third to one half of their farms appropriated to grain. The vast produce of potatoes, turnips, cabbages, and grass, are applied to the feeding of stock on their farms. In this way, they make more grain than they would do if a greater proportion of the land was made to produce it. The benefit to the farmer and to the land is therefore so well understood there, that it has become an agricultural maxim, that whenever a farmer discovers he can be as well paid, by cultivating food for cattle as for man, he should prefer it because of the increased quantity of manure it gives. It is not intended, by these remarks, to convert all our arable into grass land, or that the quantity of grass is to be increased by diminishing the product of grain. Stock is recommended as an auxiliary, whose agency is to be made to contribute to the increase of the grain crop, and to be subservient

to that object. There is however little apprehension that the cultivation of artificial grasses is so far to extend as to occupy all our arable space; their total neglect at present forbids even the existence of such an idea. The cultivation of artificial grasses is so intimately connected with the maintenance and value of stock, that a few further remarks on them here, with an account of the present mode of grazing stock, and a proposed substitute, will close this number.

The practice of grazing our arable fields, which undergo such severe cropping without receiving any manure, cannot be too much reprehended. The pasturage from such fields must be light and scanty, and the stock little benefited, while the injury to the land is great. These fields return too quickly to the plough for the farmer to enjoy the advantages of grasses sown on their surface, even were they rich enough to produce it; but in their exhausted state, (as is now too generally the case) they require the nurture of enclosing to bring them into good heart to produce grass, which requires good land to bear and sustain it. A substitute may be found for this improper mode of management, by appropriating a part of the farm to arable and a part to grass land; each part may then be managed according to the principles calculated to promote the ends in view, whereby a clashing of pursuits will be avoided and the farm freed from a double taxation of tillage and grazing, until it becomes sufficiently improved to bear it. The arable to be under one inclosure, without cross fences, to enjoy all the benefits of inclosing, and the grass land to be divided into lots for a succession of grazing. A spirited and persevering industry in the cultivation of artificial grasses, will be found to be the most effectual mode of sustaining and increasing live stock, and consequently of adding fer-

tility and productiveness to our farms. By grass, stock is produced; by stock, manure; by manure, grain and grass again. By the cultivation of artificial grasses, a new era will be introduced into our system of agriculture. Winter food, and the consequent value of live stock, will be increased many fold.

Their cultivation will not be merely valuable in itself, but will spread its beneficial influence over every other branch of husbandry. It will supply what has always been regarded as the greatest desideratum among farmers, a double, perhaps a treble quantity of putrescent manure; and without any exaggeration, it will be said to have added a second productive season to the year. Even during the severest winter, a part of our fields will be covered with the richest verdure; and the result of their cultivation will be, that the number of our live stock will not be merely increased, but their value and profit trebly advanced.

LIVE STOCK.

Continued.

No. XLII.

The live stock generally embraced on a farm, consists first of the working animals, comprising horses, mules and oxen; and secondly of cattle, sheep and hogs. These will be treated of in the order in which they are named.

The great number of horses in our country is a serious and sore evil: and the wasteful manner in which they are fed, makes it much more grievous. They eat up the bread designed for man—Every superfluous horse ought to be dispensed with; and the aggregate number of such is great. They (also taking into consideration the wasteful manner in which they are fed) consume thousands of barrels of corn which might be saved to the land, or converted into support for rational creatures. The evil might be remedied by legislative assistance, in making our roads better and our fine streams navigable, which would render much less of these animals unnecessary, now kept exclusively for waggoning. An immense saving might also be made in feeding horses, by paying a little attention to the manner in which their food should be prepared.

Every kind of grain upon which horses are fed should be chopped or ground: as by adopting this practice, at least one half and frequently two thirds are saved by it. It may be affirmed, that one ear of corn ground and mixed with cut straw of any

kind will go as far in supporting or improving the condition of a horse, as three ears given in the grain.

The practice of grinding Indian corn in the cob, to powder, for the purpose of horse feed, is now common in many parts of the union, particularly in Pennsylvania, among the German class of our fellow-citizens. Those industrious and economical men are ever attentive to the health and general welfare of their farm stock, and readily adopt any measure calculated to promote either object; and as they are convinced of the nourishing qualities of the cob, and the economy of the practice of using it as an article of food, they have encouraged the general erection of the necessary apparatus, in the mills in their different settlements, for the purpose of grinding the grain and cob together. If those owning mills in this section of the country were to erect the necessary apparatus for grinding corn in the cob, they would merit and receive the thanks and support of every farmer for effecting such a saving as these mills would produce in the food of horses. Indian corn is of itself too nourishing, and too heating as a constant article of diet for horses, and if fed alone, a sufficient quantity cannot be given to them to produce the stimulus of distension, which is as necessary for a working horse, or even to man, as nourishment) without great expence, and at the same time endangering the health of the animal. Hence the utility of grinding the cob in the grain, or of mixing the corn meal with a portion of cut straw, and coarsely ground rye or shorts; the powder of the corn cobs, however, does not act entirely by distension, it also contains much nutriment, and by being mixed with the corn meal, makes it more mild and nourishing. Rye, or fall barley, ground and mixed with cut straw, also constitutes an excellent food for horses. Horses fed upon cut straw mixed with meal, is known

by all those who have tried it, to keep them in a finer and more healthy condition than any other food which can be given them.

By means of cutting machines, a great economy has been effected in the use of straw and hay. It has been ascertained by accurate experiments, that one pound of straw or hay cut up fine and given to stock, particularly horses, will go farther than two pounds given whole; a saving of such magnitude as to induce every man who has not these useful machines, to obtain them immediately if he has any stock to feed. By grinding all the grain given to our horses, an immense saving is not only made in the grain itself but extends to the straw and hay used with it, and effects the enormous saving of one half in these; and by adopting this practice, a great saving of labor will also be effected in cultivating small grain as a food for horses, instead of Indian corn.

A small mill should be erected on every farm to operate by hand, or by horse or water power, to grind any sort of grain for the stock.

Horses and mules ought to inhabit a lot having a stable and stream, and to be excluded wholly from grazing. During two months of the summer, they may be soiled on clover cut daily and permitted to lie six hours in the sun, to prevent the slabbers and their being hoven. When the clover fails, hay and fodder will succeed, which will for the balance of the year keep them in dry forage. By being kept up the whole year, they will always be ready for work when wanted, and the labor of collecting them from pastures will be saved in the summer, whereby the loss of the morning so material at this season of the year, and in a warm climate, will be avoided; by littering the stables and yards well in winter, they will make a considerable part of the manure to be hauled out in the spring, and by this mode of ma-

nagement, the working stock, exclusive of their labor, will subscribe largely to the renovation of the soil, instead of its impoverishment by grazing.

OXEN.

No. XLIII.

Next to the recommendation of the best modes of culture, the cheapest means of effecting it, deserve our attention, and lastly frugality in the consumption of our produce. The introduction of a more general use of oxen as substitutes for horses in the cultivation of the earth, and the other operations of husbandry, have high claims upon the attention of our farmers, as being attended with many advantages. But there is in this country a strong prejudice against this generous animal, which is the first thing to be got over—when that is removed, the credit of the ox will soon follow.

It is a fact, which cannot be disproved, that oxen in some sort of work, are equal to horses; in these cases, they certainly ought to be preferred, because they are kept at considerably less expence, and less casualties attend them. Although oxen cannot well be used to the entire exclusion of horses, yet there is, undoubtedly, a great deal of work that they would do as well, particularly in carting and all heavy work. In most instances they are nearly equal to horses, and in their support they are infinitely cheaper. Since fall and winter ploughing for the succeeding year's corn crop, are coming into general use, the value of oxen will be more highly appreciated; as

at this cool season of the year they may be usefully employed at the plough in following up the land, or engaged in hauling in the corn crop, while the horses are at this work. The late President Madison, in his address before the Agricultural Society of Albermarle, has some new and valuable remarks on oxen, which claim the particular attention of every husbandman.

"I cannot but consider it as an error in our husbandry, that oxen are too little used in the place of horses. Every fair comparison of the expence of the two animals, favors a preference of the ox. But the circumstance particularly recommending him, is, that he can be supported when at work, by grass and hay; whilst the horse requires grain and much of it; and the grain generally given him, Indian corn, the crop which requires most labour, and greatly exhausts the land. From the best estimate I have been enabled to form, more than one half of the corn crop is consumed by horses; including the ungrown ones; and not less than one half by other than pleasure horses. By getting free from this consumption, one half the labour, and of the wear of the land, would be saved, or rather more than one half; for on most farms one half of the corn crop grows on not more than two fifths, and sometimes a smaller proportion, of the cultivated fields; and the more fertile fields would of course be retained for cultivation. Every one can figure to himself the ease and convenience of a revolution which would so much reduce the extent of his corn-fields; and substitute for the labour bestowed on them, the more easy task of providing pasturage and hay. But will not the ox himself when at work require grain food as well as the horse? Certainly much less, if any.

Judging from my own observation, I should say, that a plenty of good grass, or good hay, will suffice without grain, where the labor is neither constant nor severe. But I feel entire confidence in saying, that a double set of oxen alternately at work, and therefore half the time at rest, might be kept in good plight without other food than a plenty of good grass or good hay.

"And as this double set would double the supply of beef, tallow and leather, a set-off is found in that consideration for a double consumption of that kind of food. The objections generally made to the ox are, 1. That he is less tractable than the horse. 2. That he does not bear heat as well. 3. That he does not answer for the single plough used in our cornfields. 4. That he is slower in his movements. 5. That he is less fit for carrying the produce of the farm to market.

"The first objection is certainly founded in mistake. Of the two animals, the ox is the more docile. In all countries where the ox is the ordinary draught animal, his docility is proverbial. His intractability, where it exists, has arisen from an occasional use of him only with long and irregular intervals; during which the habit of discipline being broken, a new one is to be formed. The 2nd objection has as little foundation. The constitution of the ox accommodates itself as readily as that of the horse to different climates—Not only in ancient Greece and Italy, but throughout Asia, as presented to us in ancient history, the ox and the plough are associated. At this day, in the warm parts of India and China, the ox, not the horse, is in the draught service. In every part of India, the ox always appears, even in the train of her armies. And in the hottest parts of the West Indies, the ox is employed in hauling weighty produce to the sea ports. The mistake here,

as in the former case, has arisen, from the effect of an occasional employment only, with no other than green food. The fermentation of this in the animal heated by the weather, and fretted by the discipline, will readily account for his sinking under his exertions; when green food even, much less dry, with a sober habit of labour, would have no such tendency. The third objection also is not a solid one. The ox can, by a proper harness, be used singly as well as the horse, between the rows of Indian corn; and equally so used for other purposes. Experience may safely be appealed to on this point. In the 4th. place, it is alleged that he is slow in his movements. This is true, but in a less degree, than is often taken for granted. Oxen that are well chosen for their form, are not worked after the age of about 8 years (the age at which they are best fitted for beef) are not worked too many together, and are suitably matched, may be kept to nearly as quick a step as the horse. May I not say a step quicker than that of many of the horses we see at work, who, on account of their age, or the leanness occasioned by the coarseness of the food they require, have this advantage, where they might have once had it? The last objection has most weight. The ox is not as well adapted as the horse to the road service, especially for long trips. In common roads, which are often soft, and sometimes suddenly become so, the form of his foot, and the shortness of his leg, are disadvantages; and on roads frozen, or turnpiked, the roughness of the surface in the former case, and its hardness in both cases, are inconvenient to his cloven hoof. But where the distance to market is not great where the varying state of the roads and of the weather, can be consulted; and where the road service is in less proportion to the farm-service, the objection is almost deprived of its weight.—In cases where it must ap-

plies, its weight is diminished by the consideration, that a much greater proportion of service on the farm may be done by oxen, than is now commonly done; and that the expence of shoeing them, is little different from that of keeping horses shod."

The oxen, in summer, should be penned and fed separately from the other cattle, and in winter the same separation should take place, with a more comfortable cover. They will furnish the same supply of manure as the horses and mules in winter, if their pens are kept well and copiously littered with the offal of the corn crop. Whilst not at work, they may be pastured with the other cattle.

CATTLE.

No. XLIV.

Improving the breed of live stock, is as necessary for the farmer, as the proper cultivation of a field for wheat, corn, or any other crop.

For, according to the present improved system of farming, there is such a connection between the cultivation of ground, and breeding, rearing, and fattening cattle, sheep and other domestic animals, that a man will make but an indifferent figure in rural affairs, if he does not understand the latter as well as the former.

Our breeds of horned cattle particularly, are too little attended to; yet they should receive the primary attention of our agriculturalist. In the best cultivated countries of Europe, this subject receives that attention which its importance demands, and to

[illegible] perfection have they brought their breeds of cattle, as to render them superior to those found in the different parts of the world, and to insure for them enormous prices.

In our own country, particularly in the northern and eastern states, the raising and improving the breed of cattle, is considered as a matter of the first importance with the farmer. The different Agricultural Societies established in those parts of the union, (which are doing great good) spare no exertions by offering premiums and the establishment of cattle shows, to diffuse among the people a spirit for improving the breeds of their cattle.

In improving the breed of cattle, the objects had in view should be attended to; as there are different breeds adapted to different purposes.

A breed of cattle equally well adapted to the butcher, to the dairy, and to the plough or cart, is no where to be met with; and so far as experience enables us to judge, these properties are hardly consistent with each other and belong to animals of different forms and proportions. It should be the object of farmers to have all their stock of animals of the best breeds: and to study useful qualities, more than theory figures. Yet well proportioned and sightly animals are generally the most valuable, both as it regards usefulness and keep. There are exceptions: in dairy cows particularly. Hardihood, and easiness of keep, should always be prominent qualities in any breed of cattle.

The value of horned cattle will increase in proportion to the manner in which we manage them to secure their dung. During the spring and summer they should be regularly penned of nights on such parts of the farm as may need manuring; observing to plough up these pens immediately after the removal of the cattle, to secure their manure against

loss from the evaporation of the sun and washing rains. The size of the pens, and the time they should stand in them before removed, will be regulated by the number of the cattle and their condition; but in hot weather, the pens should not stand longer than two weeks before ploughed up, at most. In winter, as has been before observed, they should have a comfortable shelter closed at every point, except at the south, which should open into the farm yard.—Corn stalks are the first food given to them; and the greatest diligence should be used in conveying them early to the farm yard, because they lose more from evaporation standing in the field, than the other articles of food, viz. the shucks, tops, &c. which should be reserved for later periods.

The cattle should be employed in manuring the distant parts of the farm, while the horses and other domestic stock are manuring at home.

The farm pens of the farmer should be situated with an eye to the convenience of the field from whence the stalks are to be hauled, and that to be manured and cultivated the ensuing year. It is better to make a lane of considerable length to conduct the cattle to water than to omit this convenience.

Many farms too unfortunately abound with parcels of exhausted land, which are turned out or are uninclosed to recover what improvement they can: these lands may be enclosed as pasturage for cattle; and by taking in some woodland, they will afford to the cattle, in the spring and summer, shrubs and coarse grass sufficient to constitute tolerable good pasture, and far better than that from arable or cultivated fields which are generally scanty of grass until towards the fall; and if meadows have been provided for grazing in the fall, they will sustain the cattle until the period arrives for their being put up in their winter's habitation. These hints for the manage-

ment of cattle, have been thrown out for the consideration of those who may hesitate to adopt the inclosing system under the apprehensions that if their stock are excluded from grazing their arable fields, no other resource will be left for them.

HOGS.

No XLV.

No domestic animal contributes so largely to our support, and that of the labourers employed on our farms, as the hog; and it is fortunate that none multiplies so fast, grows so rapidly, is as thrifty, hardy, and as easily raised. The hog may be raised upon almost any thing which the farm produces; but Indian corn, clover and pompkins, are the principal resources for his support in that part of the country with which the author is acquainted. Every one knows the value of Indian corn as a food for hogs; yet the common mode of giving it to them, particularly when put up to fatten, is not the most economical. Soaked corn is far better than hard corn, as it fattens hogs more speedily, and requires considerably less; when hard corn is given to them, it is not digested, and a considerable portion is discharged with the dung, whereby a great loss is sustained.— To avoid this loss all the corn given to them should be soaked until soft; to effect which let there be a number of tubs sufficient to provide in succession, according to the warmth of the weather, their chief food in this state, with an allowance of clean water to drink as each tub is emptied. As to the time

n cessary to soak the corn, no special direction can be given, as it depends on the temperature of the weather; it ought, however, to be so much soaked, as to prevent that indigestion which is experienced in feeding with hard corn, and is easily discovered by the dung of the hogs. Nothing is better for hogs than red clover, grazed or eaten off by them. It is so valuable, as to render them fat during summer, if they are allowed to run at large, and yet make but a small impression on the crop. But, differently from horned cattle, green clover cut and given to hogs, will not keep them in good plight. They waste as much as they eat, and do not relish it in this way, and perhaps if confined to it would finally perish — Hogs that run on clover should have a ring in the cartilage of the nose to prevent them from rooting; a rooting hog wastes its flesh, and requires more food to restore it, than is gained by the scanty prey after which it labors. The injury to clover by hogs from grazing, is infinitely less than that from any other animal, while the benefit to them from it is as great. No number necessary for domestic consumption will materially injure a clover field from grazing, when prevented from rooting.

The distillers, in a particular section of Virginia, who turn their attention much to the raising of hogs, cultivate clover as the principal support of their large stocks in the warm season. And they are found to keep so fat on clover, that it is frequently difficult to raise pigs on that account. Besides the advantage of red clover in keeping hogs in good plight, it is found during the warm season of the year, to preserve them from disease, and to cure those which have already been attacked with the staggers, sore throat, &c *

* See the 2nd vol. Memoirs Phila. Agr'l Society, page 28.

Pumpkins also constitute a valuable and nutritious food for hogs. As soon as they begin to ripen, the hogs should be put up and confined to a pen, and fed with as many as they can eat, cut up in troughs with the addition of a meal of corn a day.

The dung of hogs deserves particularly to be saved, as it is a very rich and fat manure, and so coal as to ferment very slowly. It is so rich and oily as to be double in value to cattle's dung. This is no strong a manure, that it answers well, when mixed with a large proportion of earth, weeds or straw. It is almost incredible how great a quantity of good manure may be obtained by supplying a hog pen with rubbish to mix with the dung.

One hundred and fifty hogs, if managed judiciously, will manure an acre of ground for every ten days, and gradually in a less time as they fatten to seven days. Previously to their being penned, on each acre I would cart loads of wheat straw or other litter to be equally spread over it, and at the end of ten days, let the pen be removed and the ground well ploughed nine inch and a half feet ridges. If the hogs are put up when the pumpkins begin to ripen, which is about the last of August, and if they are not killed until 1st of December, they will, during this period, have manured nearly twelve acres. I am confident, that if hogs are regularly penned, and their pens well littered, they will make far more manure than will exceed the value of their keep; and that there is but little doubt, in a climate adapted to Indian corn and clover, they are the most profitable stock which can be raised.

The little value of sheep in this part of the country where cotton can be raised so easily, justifies me in making but a few remarks on them. Except as

affording meat for the table at particular seasons of the year, and wool for family consumption, they are not an object of attention.

But their dung is valuable and will pay for the expense of their keep, if it is preserved. It is more hot and fiery than that of black cattle: it ferments quicker; it is fitter therefore for cold, heavy lands. Perhaps the best way of applying the dung of sheep to land is by folding or penning them; for in this method their urine is all saved, as well as their dung. But it ought to be turned in with the plough as soon as possible, that the sun and air may not deprive the land of it.

Feeding off turnips with sheep is a practice much pursued in Europe, where that crop is cultivated largely. The land is manured for turnips, and receives a second manuring from the sheep's dung and urine while feeding them off, which puts the soil in fine preparation for valuable grain and grass crops.

Warm shelters or covers are necessary for hogs and sheep during the severity of winter; but particularly so for sows about to have, or having pigs.—The same remark also extends to ewes and lambs, but more indispensably, as being more tender.

DRAINING.

No. XLVI.

Lands to be drained are usually divided into two classes: 1st, uplands, or those which are situated so high, that the water can descend from them, if properly collected and conducted; and 2nd, low, flat and wet lands, such as command little or no fall.

When water in descending from highlands spreads over a considerable space in a flat or hollow, a ditch should be cut in the lowest parts of the ground, deep or shallow according to circumstances, which will have the effect of drawing the water into a narrow channel, and of giving it a free and unobstructed course; by which means the land will be reclaimed and admit of cultivation to the borders of the drain.

It frequently occurs that a multitude of springs break out at the termination of the highland and spread their waters over the adjacent low grounds, which renders them useless or unfit for cultivation. If the water rises in a bold spring at the junction of the hills with the flat land, a ditch should be cut in the lowest ground in order to give it a free and unobstructed channel to the stream or main drain to which it is tributary. If a multitude of springs ooze in a continued line at the junction of the high and flat land, a deep and wide ditch should be cut, running along the foot of the highland, so as to intercept them all, which should convey the water of these springs into the main drain or outlet, or into one entering into it.

Drains, to be lasting and valuable, should be covered; otherwise, in sandy soils, and in many situations, they are liable to be filled up, or to be washed

into gullies. Covered drains, and thereby preserving a level, dry, cultivatable and productive surface, are every way eligible. In grounds where there is a considerable declivity, a straight open ditch in the direction of the declination, is injurious and dangerous; violent floods, in such ditches, always produce a ravine or gully. In all cases, therefore, where land lies on a declivity, care should be taken that the drains have an easy and gentle descent, which is generally effected by carrying them in an oblique or meandering direction.

Covered drains, are not liable to the ravages of floods, and may be straight, without being exposed to the dangers to which open ditches are subject.

Drains that are intended to be covered, should be cut at least three or four feet deep and gradually narrower from the top to the bottom, where they should not be above eight inches wide. A row of poles of such size as nearly, but not entirely to touch, is laid on each side of the ditch at bottom. Green or seasoned brush, without leaves, is then packed into the ditch; if the brush is crooked, it receives a chop in the elbow of the crook, and is put into the drain with the small ends downwards and then pressed down to the poles with the foot. The brush should be packed to within eight or ten inches of the top, and then covered with four inches of dry leaves or straw, and the whole of the dirt to be returned and well rammed. Drains of this kind will have, besides the advantages mentioned, the effect of curing all sour or boggy land through which they may be cut; as the oozing water will be received by the straw, and trickle through the brush down to the open drain, and the wet ground will lose every boggy appearance.

Drains of this description will last a long time, as the brush is completely secured against the effects of

the sun and wind. Where rock can be had, drains of this description may be made to last forever; the best method is to place flat stones standing on the bottom and along on one side of the drain, as perpendicularly as the side will admit; then another row of flat stones on the opposite side, placed with the top part to rest against the upright stones, in the form of ∧ making a kind of angle; should this cavity be insufficient for the current of water, another flat stone may be placed in a reversed form, as ∧> by which there will be a double vacuum fully sufficient for the greatest current.

The remainder of the drain may be filled up with stones, to within about eight inches of the surface; then covered with straw or leaves to prevent the earth from falling between the stones, and fill up the remainder with the dirt that came out of the drain.—Covered drains which have the smallest passage for the water at the bottom, are reputed to be the most durable; as the force of the water has been found sufficient to clear away any small obstacles, accidentally obstructing its course.

DRAINING

Continued.

No. XLVII.

The simplest mode of draining is with the plough, which may be used to great advantage upon flat, stiff and close land. Land of this nature generally holds the water which falls upon it, it being too close to absorb it until it escapes by evaporation; and under the flat culture habit, its only use is to poison the air and destroy the crops which are put upon it. This rigid land though intended for Indian corn, is generally left unbroken till spring, by which time it has acquired such a degree of excessive moisture as to be unfit for cultivation; and the usual mode of ploughing it into a flat surface, tends to retain the moisture, and to promote its baking and more close consolidation. A mode of culture which will effect the draining of such land of its excessive moisture, will be the only way to render it susceptible of producing good crops; and in most cases it can be effected by the plough. Land of this nature should be thrown with the plough into high ridges and deep furrows, and in ridges calculated for Indian corn of five and a half feet width, the bottom of the furrow may easily be made fifteen inches lower than the top of the ridge. The deep furrows will have the effect of draining and drying the ridges and of holding all the superfluous water they may have contained, and in case of a descent, will serve as so many ditches to convey it off; but even in case of no descent, the deep furrows will still have the effect of relieving the ridges of a security of moisture, and thereby place them in

a state to be operated on by frost. It has elsewhere been observed, that land of this kind, by skilful ploughing and draining in the fall, is capable of being converted into the best of our soils. The ploughing, being done in the fall or early in winter, is essential to its success; as nothing has so powerful an effect in subduing a stubborn soil and breaking down clods as the winter's frost.

In low and flat land, which abounds with ponds and puddles, the most obvious mode of proceeding should be, to cut ditches in the lowest parts of the ground, in order to carry off the standing water: the ground then to be thrown into ridges and furrows, taking care to lay them out in such a manner as that each water furrow shall empty into one or more of the ditches.

One of the greatest errors committed by the generality of farmers, is the neglect of the brooks and streams running through their farms.—They permit strips of woods to remain on each side of them, to grow up in bushes and briars, and to abound with a multitude of bogs and marshes.—A neglect of these streams, not only disfigures the farm through which they run and indicates a slovenly cultivation, but subjects the adjacent low grounds to inundation, and the health of their families to sickness. The channels of few of these streams retain any appearance of their natural state, being every where obstructed by sands, bushes and rubbish, so as to form innumerable putrid puddles and pools, on the occurrence of every drought, to several of which our summers and autumns are liable. By stopping and spreading the waters of our creeks and brooks, they soon cease to flow in droughts; and the water which might at all times be carried off in a healthy current, in wet seasons overflows the adjacent grounds, and in drought poisons the air, because then evaporation be-

comes its only channel of escape. Many farmers, to my own knowledge, have been so blinded to their own interest and that of their neighbors, that in clearing lands on the borders of creeks, have made it a practice to throw every tree into the creek near enough situated, and to roll in large logs for the purpose of conveniently disposing of them; thereby creating rafts for the destruction of low grounds and the crops on them—that of mill-dams and bridges and the health of families. No law, I think, could be more salutary than one imposing a heavy fine on those in the habit of such practices; for what inducements has a person to clean out a stream which may run through his farm, in order to give it a free and unobstructed channel, if one above him has the liberty of filling it up with logs, trees and brush, to be brought down by the first fresh?

Such laws are not novel to some other states, and to them they are indebted for some of their finest farms. If health and a taste for cleanly farming, are not sufficient inducements to clean up our creeks and rivulets, so as to bestow on them unobstructed currents, and to cultivate their borders, the fertility of these borders, and the advantages gained to the adjacent grounds would be sufficient considerations.

After having cleaned up the borders of our streams, the next step should be to clean out the streams themselves. This may first be done by removing the logs and stones and rubbish lying immediately in their channels; cutting also through veins of rigid earth, paring off sharp points, and widening the channel where too narrow, will more effectually enable the stream to do a part of the work itself by deepening its bed the more rapidly. When the course of a stream is in a straight line, or nearly so, it hardly ever overflows its banks, unless the stream rise

much above its common level. But the most common cause of streams encroaching on their banks, is the water [illegible] a sudden bend. In low grounds it is therefore of advantage to straighten the course of the stream, for every impediment, or obstruction, will naturally cause the water to rise higher than it otherwise would do; and as such bends have that effect consequently in the time of a fresh, the water will overflow a greater extent of ground, and to a greater depth, than if the stream had a free and uninterrupted course straight forward.

But the course of a stream should not be entirely straight, as it gives such a force to the current as to expose a sandy or crumbling soil to constant wearing, and damaging the point upon which it expends its greatest force to great injury; gentle bends are to be preferred as they check the impetuosity of currents. If the windings of a stream cannot be altered, and encroachments are making on some part of the banks, it must first be considered, whether the force of the water can be directed to another place where less injury will be done. In straightening streams and cutting ditches, the lowest ground should always be adhered to. In doing this, also in widening channels, making new ponds, cleaning and deepening drains of any kind, one of the most obvious, and most common errors, is to leave the earth on their borders, so as to dam out a considerable portion of the water the drain was intended to receive, and to destroy all the crops within its influence. This earth might most profitably be employed in [illegible] filling hollows and sunken places, leaving the edges of the drain every where lower than the adjacent ground. By this means less damage will ultimately occur, and more rapidly return to the channel; because as the water is every where trickling into the drain as the rain falls, it has more time to dispose

of it, and for the same reason an excess will sooner be reduced. Both the rapid and complete reduction of floods is of great importance to crops, few of which will sustain much injury from a very short immersion. They are ruined for want of a remedy against stagnant water. Drains in the lowest ground, with edges lower than the ground designed to be drained, aided by ridges and furrows, emptying into the drains, will afford this remedy in the most perfect manner.

NOTES.

[*Note A. page* 80.]

Description of the Rafter Level mentioned in No 17, on Horizontal Ploughing.

(See Engraving.)

It consists of two legs of common wood, A and B, which are joined together at the top, and their lower ends widened to the distance of ten feet apart. The legs are connected below by a cross bar, and kneed in the usual manner. From the angle at the top, a plummet C is suspended by a small cord; which, when a mark is made in the middle of the connecting bar, and the two legs are adjusted to a level, will strike such mark, so that the horizontal level is ascertained.

Many farmers are getting into the practice of laying off their hilly land horizontally, by the eye, than which there cannot be a more erroneous method, as it cannot be done correctly, and will only tend to aggravate the evil it pretends to remove. It is recommended to all those who wish to preserve their hilly land from washing, to use the rafter level and according to the manner pointed out in this work. It is fortunately an instrument so simple in its construction and so easily used, as to make it inexcusable in any man to neglect it, who cultivates hilly land.

[*Note B. page* 123.]

(Referring to No. 27, on Wheat.)

Those who have adopted the mode of cultivating Indian corn in ridges, find a difficulty in putting the same ground in wheat. They are in the practice of destroying or ploughing down the ridges in putting in wheat, whereby the labor of fallowing up the ground for corn again is greatly increased.— One of the greatest advantages gained by ridges and furrows, is the ease and efficacy with which the ridges are reversed, when the ground comes round in course again, to be put in corn. The water furrow enables us to bury deep the litter, whether of weeds or clover, produced by inclosing; so that the corn is planted above it and sprouts in a bed of clean earth.

Much labor is also saved in fallowing, because the deep water furrow enables the plough to cut off a wide land on each side of it, by which it is filled, without needing itself a touch of the ploughshare, leaving a string of the old ridge, so narrow that a large plough, with two mouldboards, splits it. And thus three furrows reverse ridges of five and an half feet wide. In sowing wheat, therefore, the ridges should be [illegible], and the water furrows left deep and wide and [illegible], and many experiments have proved, that the [illegible], however the surface may be contracted, in [illegible] the labor in the subsequent preparation for corn and the improvement by deepening the soil

[*Note C. page* 191.]

No. 1.

Skimmer or Plough for weeding Corn.

a a. An iron rod 1¼ inch wide and 1 inch thick. At one end an eye for the helve. At the other a duck's bill—25 inches long—having a small crook at the junction of the wings next the eye, to raise the eye two inches, that it may not drag on the ground.

b b. The outer edges of the wings, to be 26 inches apart.

ccc ccc. The cutting edges of the wings, to be on a level with the lowest part of the bar.

ddd ddd. The upper edges of the wings, to be three inches higher than the lower edges. The wings are to be made rounding, to increase the ease with which the earth falls over them.

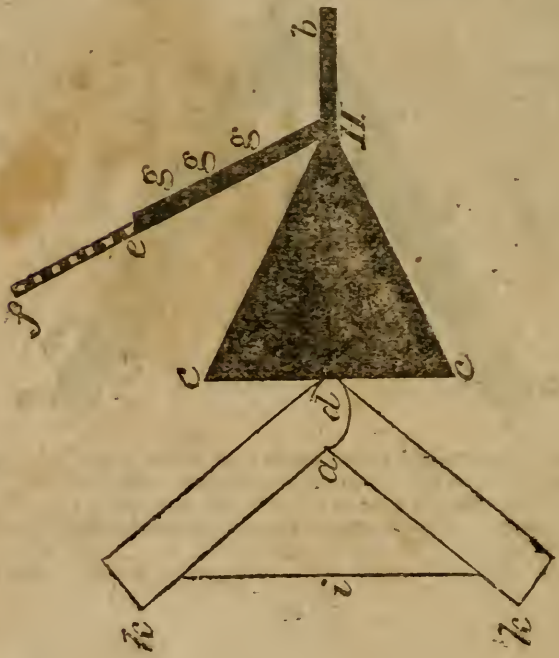
ee ee. Length of wings—20 inches.

f f. Width of do—5 inches. The lower edges of the wings to be sharp, and ought to be steeled.

The depth of its work is regulated by the traces.

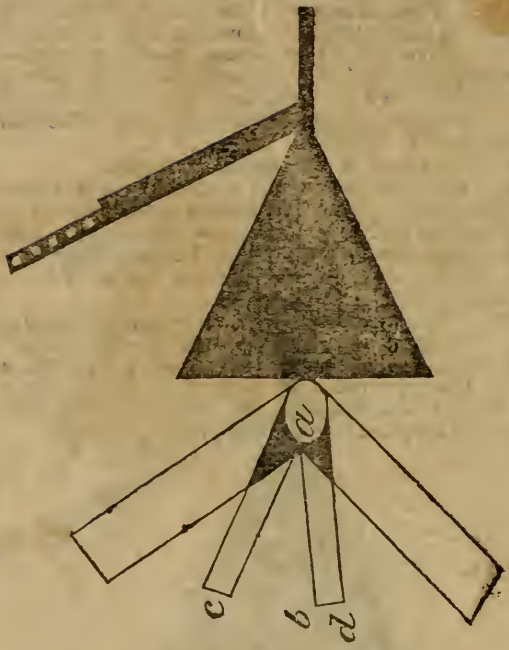
No. 2.

Trowel hoed plough for opening water furrows.



a b. Length of hoe—20 inches.
a d. Length of the eye—4 do.
c c. Width of the hoe—16 do.
He He. The cutting edges of the hoe 16 inches. The edges are to be nearly two inches lower than the centre H d. So that the eye may stand that distance above the earth—So as not to drag on it, and also to cause the under part of the plough to be hollow for the same reason.
H b. The point of the coulter—3 inches. The coulter is in a line with the eye.
H f. The length of the coulter—22 inches.
H e. The lower part of the coulter 12 inches long—with the cutting edge, g g. The coulter is fixed at the end of the plough by a tenon and mortice. The former on the end of the plough—the latter in the head of the coulter.
e g. Width of the upper end of the coulter 2 inches—of the cutting part 3.
ak ak. Mouldboards—Length 18 inches—Width 9 inches.
k k. Width between the mouldboards—20 inches.—In the eye is fixed a wooden helve, to which the mouldboards are nailed. The upper end of the coulter is made fast in the beam.
i. A pin 1 inch diameter, let into the mouldboards and wedged, to keep them from being pressed together.

No. 3.



a b Length of mouldboards—12 inches.
b c. Width between the mouldboards—6 do.
b d. Width of mouldboards—6 do.

REMARKS.

The above are the implements alluded to in the remarks on the cultivation of Indian corn, page 198 of this work.

No. 1, much preferable to a harrow as a weeding plough. It is drawn by one horse or one ox.

No. 2, is the best plough which has been tried for opening water furrows, to be drawn by two or more horses. The deeper these furrows are made, the more efficacious they are in improving the soil.

No. 3. This plough is a copy of No. 2, with the addition of the interior mouldboards, and the exclusion of the pin. It ought not to work deep. It immediately precedes the planting of the corn. The wide mouldboards bestow a weeding on the ridge; the narrow, form a central narrow furrow for depositing the corn in, to be covered by the foot with the mould turned up by the mouldboards. The plough is drawn by two horses, by which means the furrow is run straight.

INDEX.